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Каталог продукции BinMaster



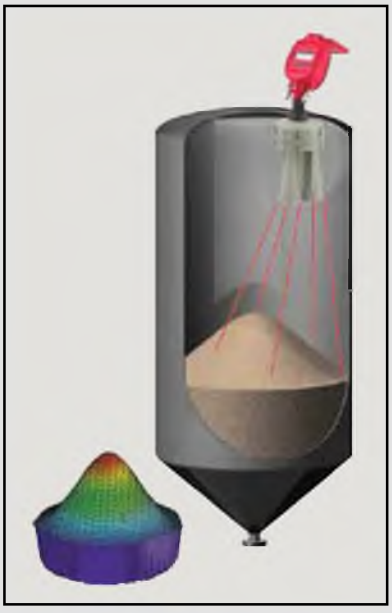

3DLevelScanner™

Accurate Volume Measurement for Powders & Bulk Solids

The BinMaster 3DLevelScanner uses non-contact, dust-penetrating technology to provide unsurpassed bin volume accuracy. Unlike single point devices, it works by measuring multiple points within the bin. This advanced acoustics-based technology is proven to perform in powders and bulk solids contained in tanks, silos, warehouses, and even open bins and piles. Its unique 3D mapping capabilities provide a visual representation of bin contents, detecting cone up or down as well as sidewall buildup.

Multiple Point Bin Volume Measurement

- Continuous and non-contact measurement
- Measures uneven powder or solid material surfaces
- Detects cone up, cone down and sidewall buildup
- Provides minimum, maximum and average distances
- Performs in extreme levels of dust
- Calculates highly accurate bin volume
- Communications include 4-20/HART, Modbus RTU, TCP/IP and RS-485
- Measuring range up to 200 feet
- Self-cleaning with minimal maintenance



BINMASTER®

Non-Contact, Dust Penetrating Bin Volume Measurement

Actual installation on rice bin.

Using patented acoustics-based technology, the BinMaster 3DLevelScanner measures bin contents at multiple points making it one of the most accurate devices on the market today. Its advanced, low-frequency technology penetrates dust, allowing it to perform reliably where other technologies have failed.

The 3DLevelScanner provides a scaled 4–20 mA output that can represent either the product or headroom volume. A digital HART communication signal superimposed on the 4–20 mA cable can enable two-way field communications, allowing for additional information beyond the normal process variable to be communicated to the 3DLevel Manager software. Multiple scanners can be directly connected via a RS-485 network to a PC running the 3DLevel Manager software or to multiple computers on a network using TCP/IP via a RS-485 network. Alternatively, a Modbus implementation can utilize the RS-485 network to send data. Theoretically, it is possible for up to 64 scanners to be polled on one RS-485 network.

Works in Dust

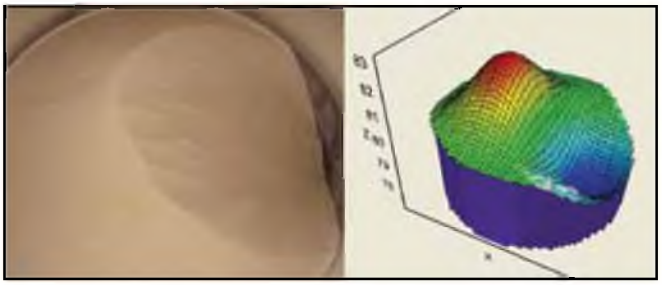
The 3DLevelScanner uses a very low frequency acoustical signal to penetrate dust and take measurements which are determined by how long the signal takes to "travel to" solid or powder material and "return to" the device. These very low frequency acoustical signals are able to penetrate suspended dust, unlike other technologies whose signals become "confused" when attempting to take measurements in dusty environments. The acoustical signals, combined with a non-stick material, prevent material from adhering to the internal workings of the device ensuring long-term reliable performance. The 3DLevelScanner is self cleaning, offering very low maintenance in even the dustiest environments.

Outer unit is coated with buildup from dust.

Inside the unit is clean and fully operational.

Multiple Point Measurement Ensures High Accuracy

Unlike conventional technologies that measure one point and determine a single distance, the 3DLevelScanner scans and takes measurements from various points within the bin. These points are used to determine the volume of material in the bin. Measurement points are not averaged to calculate bin volume. Instead, each point is given a "weight" or strength of accuracy rating assigned by an algorithm to determine the true volume of material within the bin.



The image on the left shows the irregular material surface during the empty cycle; the image on the right is the visual representation created by the software.

In many cases, especially with applications prone to irregular material surfaces, there will be points in the bin that are lower or higher than the majority of the bin contents. If a simple average formula was used to determine the average height of the product, it could be inaccurate. By using an algorithm that bases the average height from all of the points and the weights associated with them to determine the average volume and height/distance, the 3DLevelScanner can provide a much more accurate estimation of bin volume.

Safe, Non-Contact Technology Reduces Risk

The 3DLevelScanner is a non-contact device, so it is ideal for food processing, pharmaceuticals, or chemicals where contact with the material being measured must be avoided. It is also suitable for "sticky" materials whose level needs to be monitored, but the material could cause problems by adhering to the measurement device. It also avoids situations such as broken or buried cables, which can cause maintenance problems and result in downtime and periods when no measurements can be taken.

Suitable for Pellets, Granulars, Powders and Most Other Bulk Solids

- Grain, Seed & Feed
- Ethanol & Bioenergy
- Chemical Processing
- Aggregates & Cement
- Food Processing
- Pulp, Paper & Wood Pellets
- Petrochemicals
- Mining & Metals
- Plastics Manufacturing
- Power Plants

3D Meets the Demand for Greater Accuracy

Inventory is money – The demand for greater accuracy applies whether the concern is just a few small silos containing high dollar resins or a million bushel bin full of corn. Each percentage point the bin measurement is inaccurate can represents thousands of inventory dollars.

Bins today can hold more than one million bushels.

Profit versus loss – Managing assets and carrying a large, high value inventory is of great concern to finance, the plant manager, or any corporate executive with profit and loss responsibility. A measurement that differs by several feet in a bin can create significant variances in volume and the calculated dollar value of the inventory.

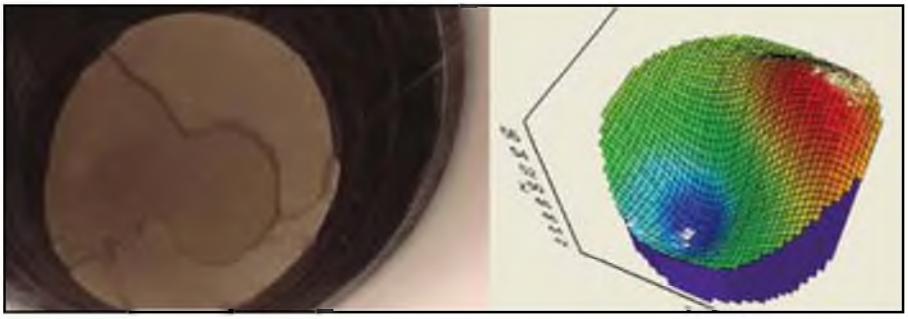
Controlling cost of goods – In manufacturing and processing facilities, raw material in bins and other storage vessels can account for the majority of work-in-process inventory. Today, it is not unusual for a bin to hold a million bushels of material.

Unexplained variances – Measuring just a single point in the bin can lead to large variances, such as when measuring the same point in the bin when filling when the cone is up or emptying when the cone is down. Excessive variances can cause unexplained material losses or result in material shortages, disrupting the production process.

Smarter purchasing and logistics – Purchasing and logistics personnel need to ensure inventory is adequate for production, while at the same time optimizing inventory turns. An accurate stock position helps to optimize inventory carrying costs, while utilizing storage capacity to optimize transportation and logistics.

Accurate volume allows for optimal scheduling and logistics.

Detects bridging and sidewall buildup – By taking multiple measurements within the bin and then mapping the topography in the bin, the computerized profile created by the 3DLevelScanner can show bridging as well as material built up on the sides of the silo. By detecting irregularities in the material surface, excessive buildup can be accounted for in volume calculations. With single point devices, a measurement may show the bin is almost empty, even when a significant amount of material remains in the bin. This feature also helps alert to the need for bin cleaning at the optimal time.

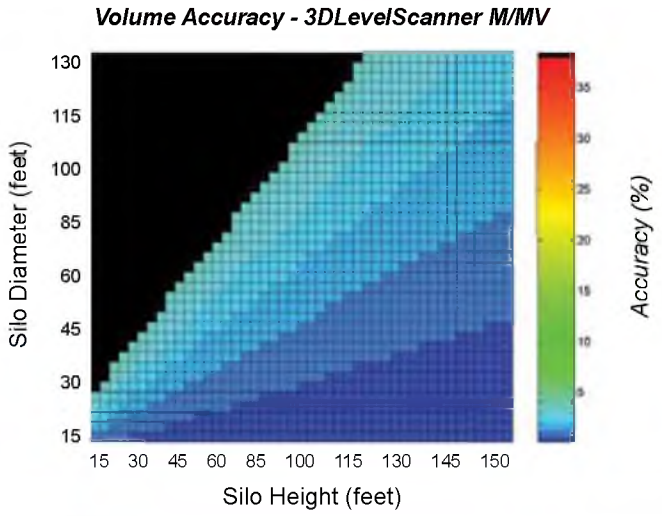


Significant bridging is evident in the photo, which is detected and displayed in the 3D image on the right.

Prevent silo collapse – There have been instances around the world where excessive buildup on one side of the silo has caused the silo to collapse. By detecting the buildup of material early, excessive damage to the silo and surrounding structures can be avoided. Installing a 3DLevelScanner can lead to a reduction of insurance claims and costly, time-consuming rebuilding of structures.

Theft detection and theft deterrence – Whether intended or not, it is not highly unusual for large amounts of inventory to simply disappear. Continuous inventory management allows for activity in the bin to be monitored and logged every day and night, and for unexplained variations to be researched promptly.

Volume Accuracy



This chart depicts the potential variances in bin accuracy of a 3DLevelScanner. The M and MV models properly applied can provide volume accuracy of .5 to 3 percent.

Narrow or Wide, Tall or Short Bin Applications

S model employs 30° beam angle for narrow bins.

There are three models of the 3DLevelScanner referred to as S, M and MV, all of which come with proprietary 3DLevel Manager software. Designed for bins up to 45' wide, the M and MV models employ a 2-dimensional array beam former that sends very low frequency, dust-penetrating acoustical pulses and receives echoes of the pulses from multiple points within a 70° beam angle on the surface of the material in the bin. The MV model offers the added feature of visualization, generating graphical representations of bin topography.

The S model is for narrow bins up to 14' diameter and up to 200' tall. The S model employs the same technology as the M and MV models, but within a narrower 30° beam angle. The S model takes an average of the numerous measurements within the narrower 30° coverage window, and calculates the average volume from the measurements within that window.

M and MV 70° beam angle for wide bins.

Models for Varying Applications

Model	S	M	MV
Bin Height	Up to 200' tall	Up to 200' tall	Up to 200' tall
Bin Diameter	Up to 14' diameter	Up to 45' diameter	Up to 45' diameter
Beam Angle	30°	70°	70°
3D Visualization	No	No	Yes
Output Data	Average distance	Estimated volume plus minimum, maximum, and average distance	3D visualization, estimated volume plus minimum, maximum, and average distance
Best Application	Tall, narrow bins with little or no corrugation	Wide bins, taller than they are wide	Wide bins, taller than they are wide

Note: Models 3DLS-S, 3DLS-M, and 3DLS-MV can be used on silos with a larger diameter than specified, but with decreased accuracies given that the beam angle will not span the entire surface of the material. Multiple scanners can be used on large diameter silos.

BinMaster 3D Benefits Add Up

Feature	Benefit
Multiple Point Accuracy	Taking measurements from multiple points versus a single point takes into account variations that can occur on material surfaces.
Dust-Penetrating Technology	Acoustical-based, low frequency technology is unaffected by dust, working where ultrasonic and radar have failed.
Non-Contact Measurement	Appropriate for foods, chemicals and pharmaceuticals as there is no risk of moving parts coming into contact with bin material. No risk of broken cables.
Volume Measurement	The M and MV models take into account multiple measurements to calculate a highly accurate bin volume (not weight or mass).
Detects Sidewall Buildup	The MV model with its 3D mapping visualization capability will detect and provide a graphical representation of sidewall buildup.
Unaffected by Material Type	Can be used in a variety of powders, granulates, pellets and other solids with no need for special calibration.
Long Measurement Range	Appropriate for tall bins (taller than they are wide) and able to measure a range up to 200 feet.
Low Power	Consumes very little power, making it cost effective to operate.
System Redundancy	Three independent transducers help to ensure accuracy.
Remote Configuration	A remote link with BinMaster's engineering laboratory during the initial installation period allows bin parameters to be loaded in the software and fine tuned for optimum performance.
Self Cleaning	The acoustics-based technology helps keep the transducers clean, requiring only periodic maintenance (every six months) in even extremely dusty environments.

3D with remote LinkPro communications.

A dusty application in an ethanol plant.

3DLevelScanner Expertise from BinMaster

More than 50 Years Experience – Since 1953, BinMaster and its parent company Garner Industries have built its reputation by treating customers right. BinMaster is financially strong and is here to service your needs now and well into the future.

Thousands of Satisfied Customers – For 50 years, BinMaster has been supplying companies of all types and sizes with a wide variety of bin level solutions. With a reputation for quality products and responsiveness from sales to service, BinMaster recognizes the lifetime value of each and every customer.

Wide Array of Products – With a complete line of point and continuous level control devices and inventory management solutions, BinMaster's skilled sales staff will fit you with what you need to address your challenges and meet your budget. BinMaster offers SmartBob cable-based systems plus rotaries, capacitance probes, vibrating rods and many more devices for indicating bin levels and conditions.

75,000 Square Foot Operation – BinMaster owns and operates an ISO certified, state-of-the-art manufacturing plant in Lincoln, Nebraska, USA and is more than 100 employees strong. BinMaster is a manufacturer of level controls and also has an extensive machine shop for metals and plastics fabricating.

Engineering Expertise – BinMaster employs five full-time engineers and has a highly experienced in-house technical support staff, plus a nationwide support network of fully-trained distributors. BinMaster's policy is to address every inquiry on the same business day.

Nebraska Ethanol Plant

Wisconsin Corn Bins

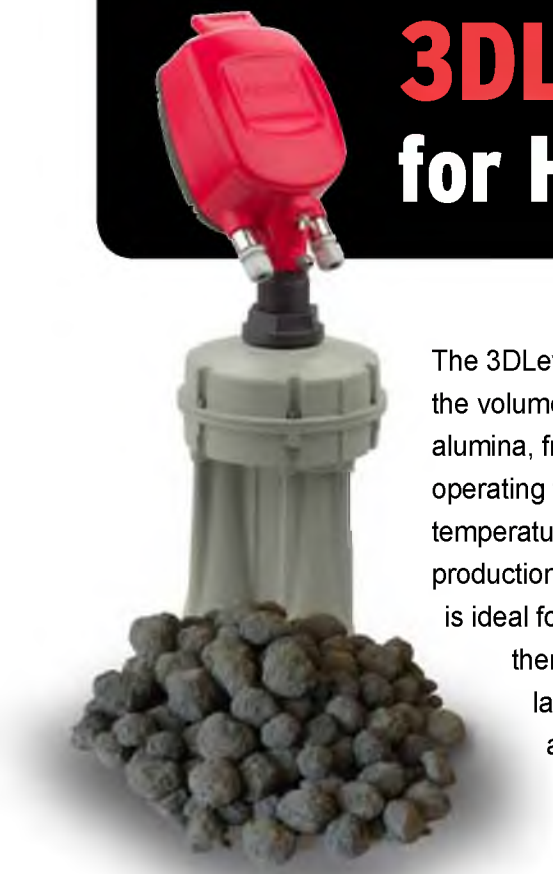
Texas Beverage Processing Facility

Nebraska Snack Food Plant

APM

Featuring APM Automation Solutions Ltd Technology (patent pending)

3DLevelScanner HT for High Temperatures



The 3DLevelScanner HT is designed to measure the level and estimate the volume in storage silos containing challenging materials such as clinker, alumina, frac sand and fly ash. This model of the 3DLevelScanner has an operating temperature range of up to 356°F (180°C) to accommodate higher temperatures that may be present when material that has been heated in the production process is conveyed into storage silos. The 3DLevelScanner HT is ideal for use in the cement, aluminum, mining and power industries where there are multiple challenges such as dust or high humidity and very large silos where the material surface in the bin may be uneven and difficult to measure.

Material	Industry
Clinker	Cement
Fly Ash	Power
Alumina	Aluminum
Frac Sand	Mining

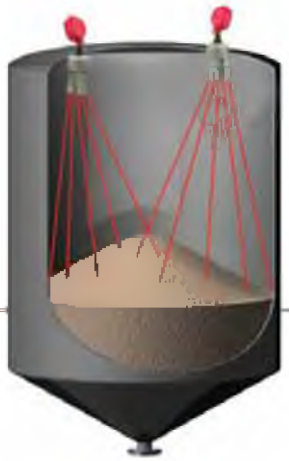
All silos at a plant can be integrated into a single network and viewed with MultiVision software.

Works in Dusty and Humid Environments

In the manufacturing process, materials such as clinker, alumina, frac sand or fly ash may be conveyed into the silo when they are still relatively hot. The 3DLevelScanner HT is designed to withstand these higher temperatures while maintaining a high level of measurement accuracy, unlike some non-contact devices that are prone to becoming unreliable in harsh environments. The 3DLevelScanner has been proven to perform in a wide variety of materials including heavy lump material like clinker, fine granular materials like alumina oxide or silica sand, or powdered materials such as fly ash.

BINMASTER®

3DLevelScanner HT
for Harsh Environments

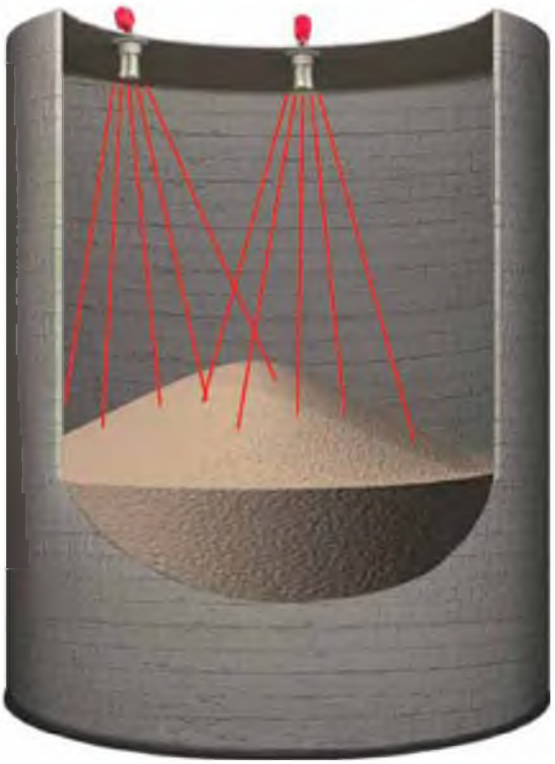


Bin Volume Accuracy for Powders & Solids

Dependent on the diameter and height of the silo and the desired level of volume accuracy, one or more 3DLevelScanners is mounted on the top of the silo in strategic locations determined by using advanced proprietary software. Each dust-penetrating, non-contact sensor sends pulses in a 70° beam angle, taking multiple measurements from the material surface and continually mapping the material surface to detect changes in level, account for uneven surface topography, and calculate a highly accurate volume estimate of the contents of the silo.

The 3DLevelManager software reports the lowest and highest points detected and the average level based upon a weighted average of all of the measurements detected in the bin. For the MV and the MVL models, a colorful graphical representation will indicate where high and low spots exist in the silo.

Precise Inventory Measurement of BIG BINS



BINMASTER®

MVL Multi-Scanner System

Grain Storage

Ethanol Processing

Cement Manufacturing

Power Plants

Storage Domes

Big Bin Accuracy from BinMaster

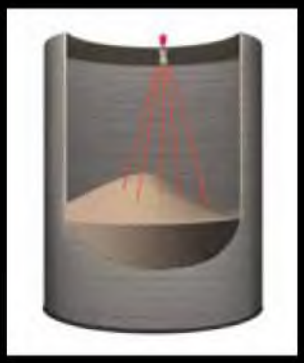
The BinMaster MVL is a multiple-scanner system that uses non-contact, dust-penetrating technology that was specifically designed to provide improved volume accuracy for large bins. Until the introduction of the BinMaster MVL system, operations with very wide, large bins, tanks and silos were relying primarily on traditional process instruments, and even manual measurements. However, as the topography of material can vary greatly in large silos or silos with multiple-fill or discharge sites, the level measurement and resulting volume estimate for the silo could be highly inaccurate based upon where that one measurement was taken in the silo.

The BinMaster MVL was designed for those operations that demand more accuracy. Properly applied, the MVL system can provide accuracy volume of .5% to 3%. By using multiple scanners to measure and map the complete product surface, the BinMaster MVL can significantly increase inventory accuracy for the very large, wide silos increasingly used in industry today. The BinMaster MVL helps operations improve financial management, better manage storage capacity, and optimize their purchasing cycles and delivery logistics.

Multiple Scanners for More Measurement Points

Although a single 3DLevelScanner provides far superior measurement data to a single-point device, it is limited to the material that the scanner can detect within a 70° beam angle. Therefore, if the bin is wider than 45', the accuracy of a single 3DLevelScanner will diminish because it can't "see" the entire material surface.

The BinMaster MVL system synchronizes the data from one or more additional scanners to cover more material surface, which makes the volume estimate more accurate. The controller is programmed to combine the data from the scanners and map the measurement points that are depicted in a visual representation of the material surface.



A single scanner measures in a 70° beam angle that does not cover the entire surface area.

Adding an additional scanner in a wide bin provides more coverage of the material surface, ensuring greater accuracy!

The BinMaster MVL eliminates the need to climb ladders to check levels.

Most big bins have a single ladder from the sidewall to the peak for bin access.

MVL Makes the Workplace Safer

Big bins are not only wide, but also can be extremely tall with sloping roofs and a single ladder from the sidewall to the peak. A storage dome roof is difficult to access and dangerous to navigate. Climbing bins or domes to check levels is undesirable and a serious safety risk, but can be virtually eliminated with an MVL system. For volatile environments, the BinMaster MVL system is hazardous location approved and FM Listed for Classes I & II, Division 1, Groups C, D, E, F & G.

Improve Financial & Inventory Management

Improving inventory accuracy can optimize logistics of deliveries and shipments.

The financial implications of materials management are significant in today's economy. Inventory is money and the pressure is on operations to increase inventory turns, purchase efficiently and replenish optimally. A few percentage points of inventory can represent tens of thousands of dollars, which in today's economy can mean the difference between profit and loss. The BinMaster MVL system allows financial, plant and purchasing management to base their decisions on very accurate inventory data. The reports generated from the MVL multi-scanner system can be used to better enhance profitability and understand inventory shrink in an operation.

Unique Visualization Feature

The controller in the MVL system combines the data from multiple scanners and sends it to the 3D Vision software that creates a single visual representation of the contents of the bin showing the topography of the material. This enables users to note cone up and cone down configurations, or identify where there may be sidewall buildup or bridging that can lead to maintenance problems. For multiple-fill or multiple-discharge vessels, the visualization can help define the next fill and empty points.

The visualization feature depicts the variable topography of bin contents.

MVL System Applications

This MVL system can measure virtually any bulk solid material, and is designed to provide accurate volume measurements critical for inventory control in many types of industrial applications such as:

- Grain silos including 105s or million bushel bins
- Large covered grain storage facilities
- Ethanol facilities with large bins of corn or DDGS
- Bins or bunkers of coal, flyash or limestone at power plants
- Large clinker, cement or limestone silos at cement manufacturing plants
- Wide soybean silos used in biodiesel production
- Animal feed stored in large silos, bunkers or warehouses
- Bins storing fertilizer or sand
- Mining operations with silos or stockpiles of limestone or ores
- Large domes of bulk raw sugar
- Ports with large storage silos and domes
- Covered domes or bins storing salt

BinMaster will provide an assessment of your bin and the application and determine if an MVL system is appropriate to meet your inventory accuracy needs.

Better Data for Better Decision Making

The BinMaster MVL system integrates the data from multiple 3DLevelScanners to accurately estimate the volume of material in the bin. As it uses data from multiple measurement points, it is much more accurate than any single point measurement device. The MVL system comes equipped with 3D Vision software that supplies 24/7 real-time access to bin data including:

- Vessel name, ID and material
- Volume as a percentage, in bushels, or cubic feet or meters
- Maximum, minimum and average levels or distances to product
- Weight in US tons, pounds or metric tons
- Real-time 3D images and historic 3D image movies
- Historical logs of bin measurements

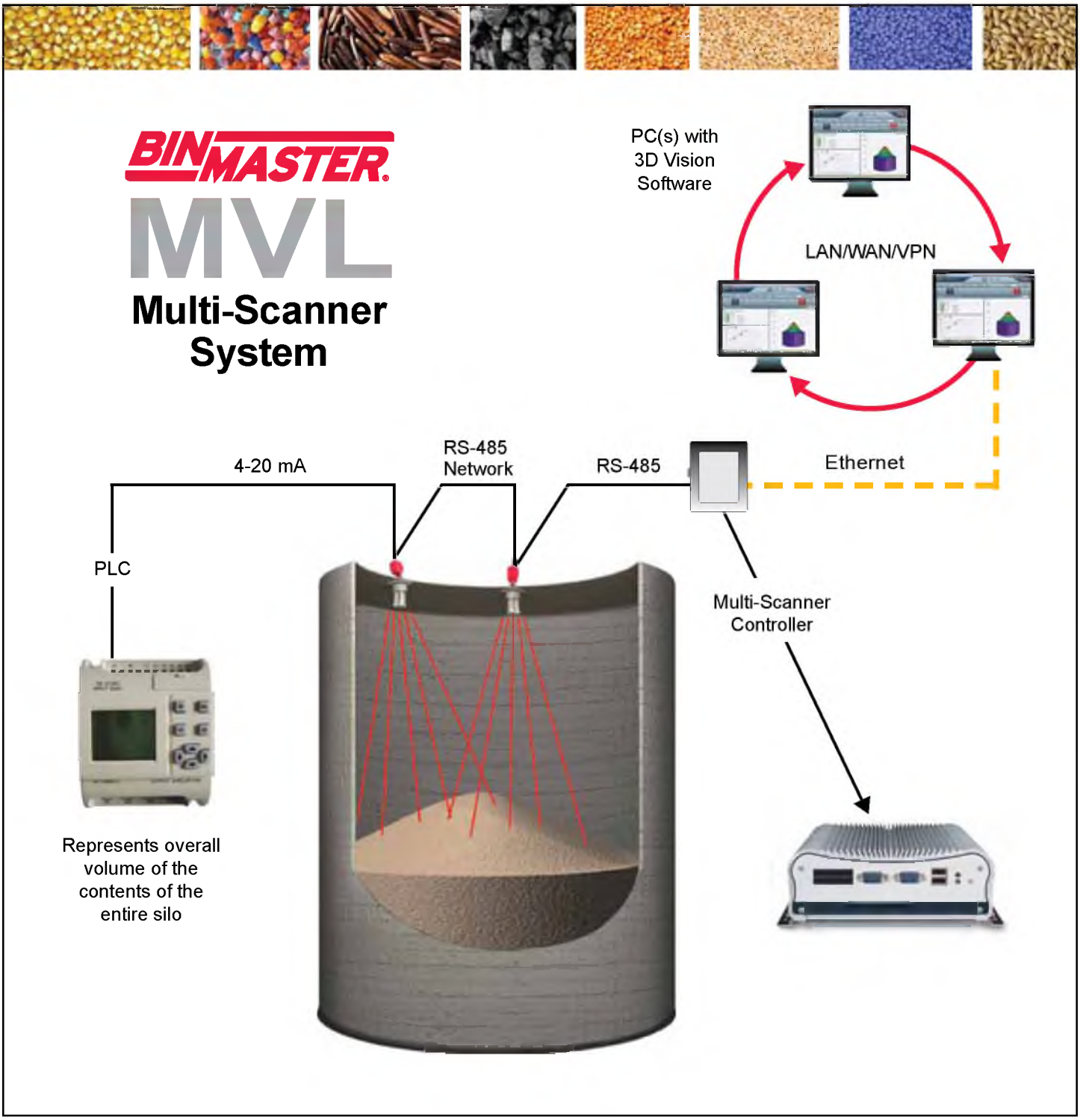
For operations that have multiple 3DLevelScanner systems – whether they are MVL, MV, M or S-type scanners – BinMaster also offers 3D Multi-Vision software that allows the user to view multiple bins at an operation by opening a single window.

Components of an MVL System

The core components of an MVL multi-scanner system include two or four model MVL 3DLevelScanners, a controller that aggregates the data from the two scanners, and the 3D Vision software that is loaded on one or more PCs.

In an MVL-2 installation, two scanners are mounted on the top of the vessel in locations optimized to most effectively cover the entire surface area of the material being measured. Generally, one scanner is mounted near the center and one eight to ten feet from the outer perimeter.

The 3DLevelScanners are connected via a daisy chain using an RS-485 protocol. The scanners take multiple measurements of the material surface using dust-penetrating, acoustic-based technology. A controller combines the data from the two scanners and generates a single merged visual representation of the topography of the material and displays the image on a PC loaded with the 3D Vision software. It can also send a synchronized 4–20 mA output to a PLC or DCS.



Reliable Level Measurement in High Dust

The BinMaster RL is designed to provide highly reliable level data, even in challenging environments where dust levels are extremely high. The non-contact, continuous level sensor works in powders and solid materials of all types. Unlike some types of non-contact level sensors, the BinMaster RL can be used in very low dielectric materials which historically have not been compatible with non-contact devices.

While similar in appearance to the BinMaster 3DLevelScanner precision volume measurement technology, the RL's narrow beam provides continuous and reliable level information with minimal time lag. It repeatedly measures the level of material in the bin and updates the level information quickly for real-time inventory management of all of the bins that need monitoring at a facility.

Non-Contact, Self-Cleaning

Another unique quality of the BinMaster RL is that it is self-cleaning and requires very little maintenance. Some non-contact technologies require manual cleaning of the sensor which entails frequent climbing of silos, which can be a safety hazard. Other devices might use an air purge, which necessitates the expense of running air lines to the top of the silo. The acoustics-based BinMaster RL features a self-cleaning, non-stick surface. For the toughest excessively humid or sticky environments, BinMaster also offers a Teflon-coated sensor option.

RL Acoustic Level Sensor

BINMASTER

Non-Contact, Continuous Level Measurement

The BinMaster RL performs better in dust compared to other technologies, such as ultrasonic. It uses acoustics-based technology at very low frequencies, which allows it to penetrate dust. The acoustic waves won't reflect off heavy dust or the material surface, which can cause erratic or inaccurate measurements. Plus, it will not "lock up" when the environment gets extremely dusty such as during filling or emptying cycles. Its performance is consistent regardless of the activity going on inside of the silo.

The BinMaster RL is an economical choice when non-contact technology is required to prevent contamination in environments such as food manufacturing, chemical and pharmaceutical processing. It is also ideal when any operation wants to eliminate the risk of a contact device that might break off and damage or get caught in equipment that might be present on the bottom of a silo, such as a sweep or conveyor.

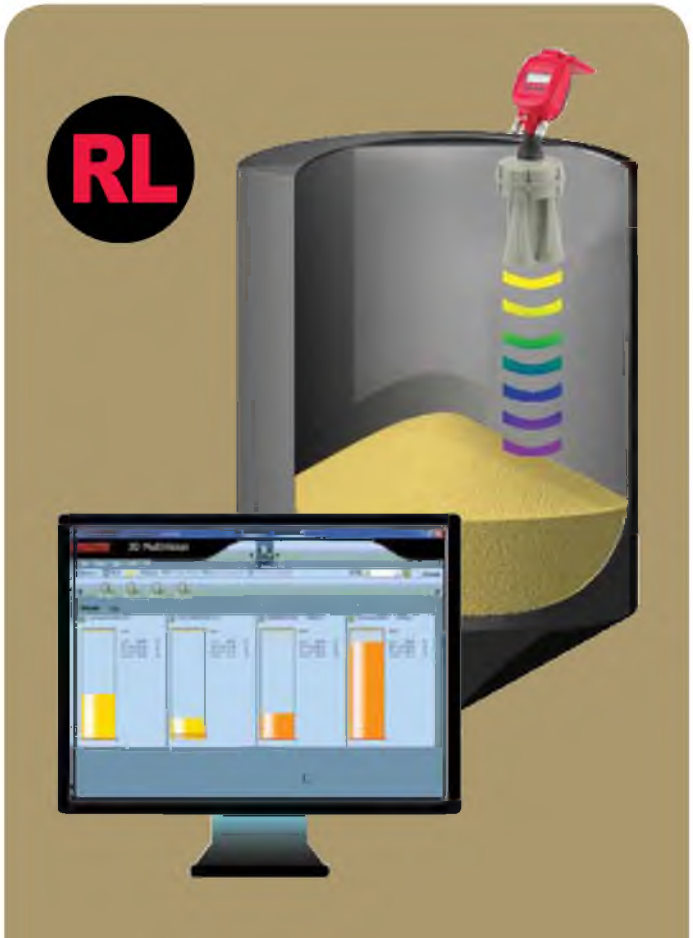
Reliable Level Measurement for Every Industry

- Grain, Seed & Feed
- Ethanol & Bioenergy
- Chemical Processing
- Mining & Metals
- Food Processing
- Pulp, Paper & Wood Pellets
- Cement & Concrete
- Sand & Aggregates
- Plastics Manufacturing
- Coal Power Plants

More Reliable Level Data Made Simple

The BinMaster RL is designed to be easy to program and simple to maintain. A "quick-start" guide allows the RL to be configured directly from a screen on the head of the device or alternatively, from a PC. It can be configured and up and running in just minutes. There's no special commissioning or start-up needed by an outside technician. It is virtually a plug & play device that allows you to install it, configure it and then walk away.

The BinMaster RL outputs a 4-20 analog signal for simple connection to an existing control system or display module. Users can view measurement data for one bin or all bins at once from a PC when the RL is used with MultiVision software. It allows you to daisy chain multiple silos to help save on wiring and installation costs. The BinMaster RL can be used in a mixed network of BinMaster 3DLevelScanners of any model including the S, M and MV. This provides the flexibility to match each silo with the sensor that is best suited for the data needed from a particular silo.



BinMaster RL for Reliable Level Measurement in Dusty Environments

- Dust-penetrating, non-contact technology
- Acoustics-based, continuous level indicator
- Works in powdered and solid materials
- Performs in low dielectric materials
- Self-cleaning, minimal-maintenance
- Economical and easy to use
- View data for all bins from a PC
- Daisy chain multiple silos to save money
- 4-20 analog output to control system or display module

Technical Data

The BinMaster RL is a new alternative for customers who want reliable, non-contact technology in harsh, dusty environments or in problematic low dielectric materials. It is ideal for facilities that need to prevent contamination in applications such as food manufacturing, chemical and pharmaceutical processing. It is also suitable for any operation that wants to eliminate the risk associated with contact devices that might break off and damage equipment in the bottom of a silo, such as a sweep or conveyor.

BinMaster RL Specifications	
Housing & antenna	Painted aluminum die casting
Inspection window in housing	Polycarbonate
Weight	12.35 lb. (5.6 Kg)
Output Signal	Active 4–20 mA/HART/RS-485/Modbus
Ambient & Process Temperature	
Ambient, storage, transport and process temperature	-40 to +185˚F (-40 to 85˚C)
Process Conditions	
Vessel pressure	-2.9 to 43.5 PSI (-0.2–3 bar)
Electromechanical Data	
Cable entry/plug	1 x M20x1.5 (cable-Ø 8...12mm), 1 x blind stopper M20x1.5
Or	2 x cable entry ½" NPT
Display Panel	
LCD	4 lines x 20 characters
Adjustment elements	4 keys
Power Supply – 4-wire instrument (Active) 4–20 mA/HART	
Supply voltage	18–32 VDC
Power consumption	Max 1.5 W @ 24 VDC
Electrical Protective Measures	
Protection	IP67 according to IEC 60529
CE	
EMC- Emission	EN 61326:1997 (class B)
EMC- Susceptibility I	EC / EN 61326:1997 +A1:1998 +A2:2001 +A3:2003
NSR (73/23/EWG)	EN 61010-1:2001
FCC	
Conformity	To part 15 of the FCC regulations
	FCC 47 CFR Part 15:2007, Subpart B, Class A
Measurement Characteristics	
Beam angle	15 degrees
Frequency	4.5 KHz
Reaction / Settling time	<5 seconds (dependent on the parameter adjustment)

BINMASTER

Bin Level Controls

BINMASTER®

Solids Flow Detect
Model FD-2000

BINMASTER

TABLE OF CONTENTS

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all National and Local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Properly ground the enclosure to an adequate earth ground.

Observe all terminal and relay contact ratings as called out on the nameplate and in the installation manual.

Insure that the enclosure cover is in place and secured tightly during normal operation.

If this product is used in a manner not specified by the manufacturer the safety protection could be compromised.

Safety Terms and Symbols

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

SPECIFICATIONS

Power Requirements:	2.0 Watts at 24 VDC +/-10%
Operating Temperature:	-22°F to +140°F (-30°C to +60°C)
Storage Temperature:	-40°F to +176°F (-40°C to +80°C)
Detection Range:	1.5 m (4.9 ft)
Output Delay Range:	Switchable: 0.1 to 3.1 sec / 2.3 to 15.1 sec
Relay Outputs:	250 VAC / 220 VDC / 2A
4-20mA Output:	No Flow: 4 mA +/-4% Flow: 20 mA +/-4% Fault: 22 mA +/-4%
4-20mA Load:	650 Ohms Maximum
Emissions:	24.11 GHz, 6.6 mW typical/9.9 mW maximum
Enclosure:	White Powder Coated Aluminum, NEMA 4X
Mounting:	1-1/4 inch NPS
Conduit Entry:	3/4 inch NPT
Process Pressure:	80 psi

INTRODUCTION/DESCRIPTION

The model FD-2000 solids flow detector is an industrial instrument that senses flow or no-flow conditions of solids and powders in pneumatic pipelines, gravity chutes and feeders. It uses microwave Doppler technology to provide highly sensitive motion detection. The sensor is completely non-intrusive, avoiding contact with the flow stream and associated wear problems.

The FD-2000 is a single piece system that contains the sensing element, the power and output connections and user adjustment controls. It provides both a relay output and current output for indication of flow or no-flow. Both normally closed and normally open contacts are available at the relay output.

The FD-2000 sensor unit emits a low power microwave signal toward the material being monitored. Part of this signal is reflected off the material back to the transducer of the FD-2000. This reflected signal combines with the emitted signal to produce a beat frequency, which is the difference in frequency between the two signals. If the material being monitored is not moving, the reflected signal will be the same frequency as the emitted signal and there will be no beat frequency produced. However, if the material is moving, the reflected signal will be shifted in frequency and a difference or beat frequency will be produced. This shift in frequency is called the Doppler Effect. The presence or absence of this beat frequency is sensed by the FD-2000 to detect a flow or no flow condition.

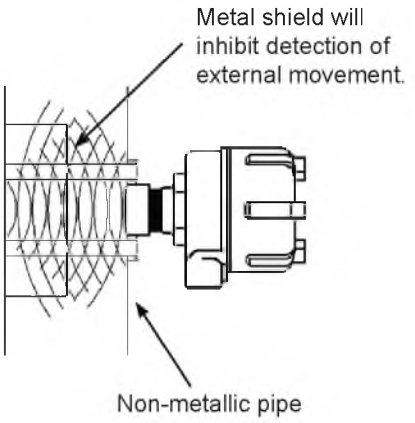
Microwaves are extremely high frequency radio waves and as such pass through non-metallic materials with negligible attenuation. This means that the FD-2000 can see through a plastic pipe, a glass process seal or the wall of a wooden chute to detect the motion of material inside. This also means that the FD-2000 can look all the way through a plastic pipe or wooden chute and see a person walking on the opposite side. Therefore, in some installations where this situation may occur, a metallic material will need to be placed on the opposite side of the pipe or chute to prevent the FD-2000 from seeing objects on the other side. Adjusting the sensitivity of the FD-2000 to a lower setting may eliminate the sensing of moving objects on the other side of a nonmetallic pipe or chute.

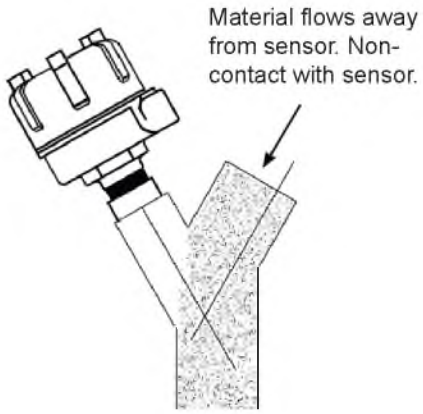
Location and Mounting

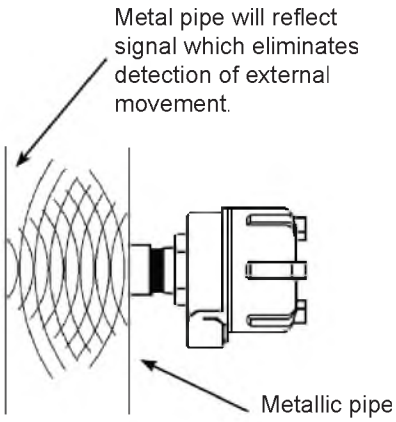
The FD-2000 is mounted at the process site where the movement of material is to be monitored. Often this will be on the side of a chute or flow pipe where access by personnel is difficult or limited. When selecting a location, attention should be given to the temperature limits of the sensor to make sure they are not exceeded. And, although the unit is equipped with a filter to reduce the effects of mounting vibrations, it should be mounted where it will not experience excessive vibration as this can be detected as motion and give a false indication of flow.

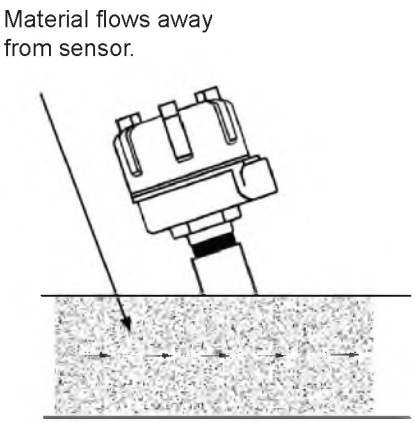
The sensor best detects movement of material moving directly toward or away from the unit. However, mounting the unit perpendicular to flow usually works because there is adequate fluctuation of material as it flows past to allow detection. In some cases where the material is very light and difficult to detect, it may be necessary to mount the unit at some angle off perpendicular to the flow. An angle of 20 to 30 degrees from perpendicular is usually sufficient. Refer to Figure 1 for examples.

Good Mounting Practice

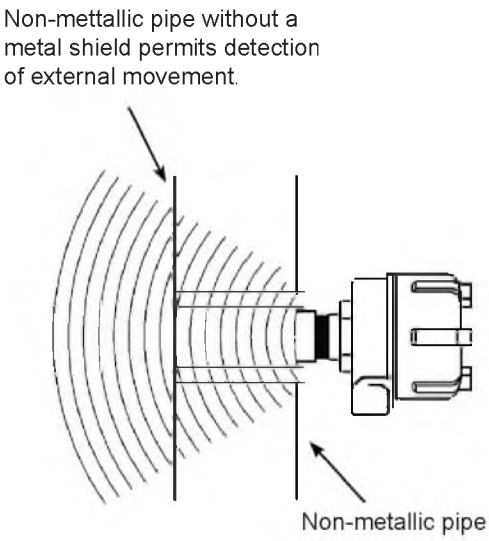








Poor Mounting Practice



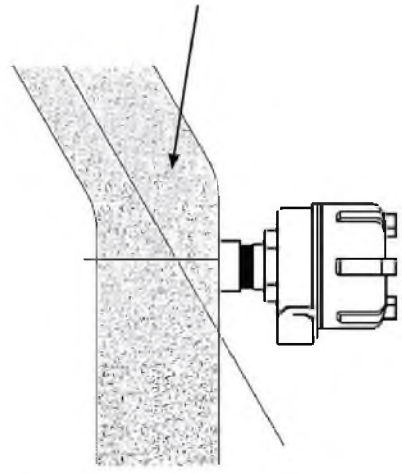


Figure 1

For installations where the sensor needs to monitor flow through a metal pipe or chute, an opening will have to be made in the metal wall. If necessary, a suitable seal made of nonmetallic material should be provided for this opening. For some installations, the seal provided on the FD-2000 sensor would be adequate. Care must be taken so as not to exceed the pressure or temperature rating of the FD-2000.

The unit should be mounted so that the conduit openings are down, as shown in Figure 2. If being used in an environment with high levels of moisture or moist air, then the conduit openings should be sealed with a duct seal compound or appropriate putty.

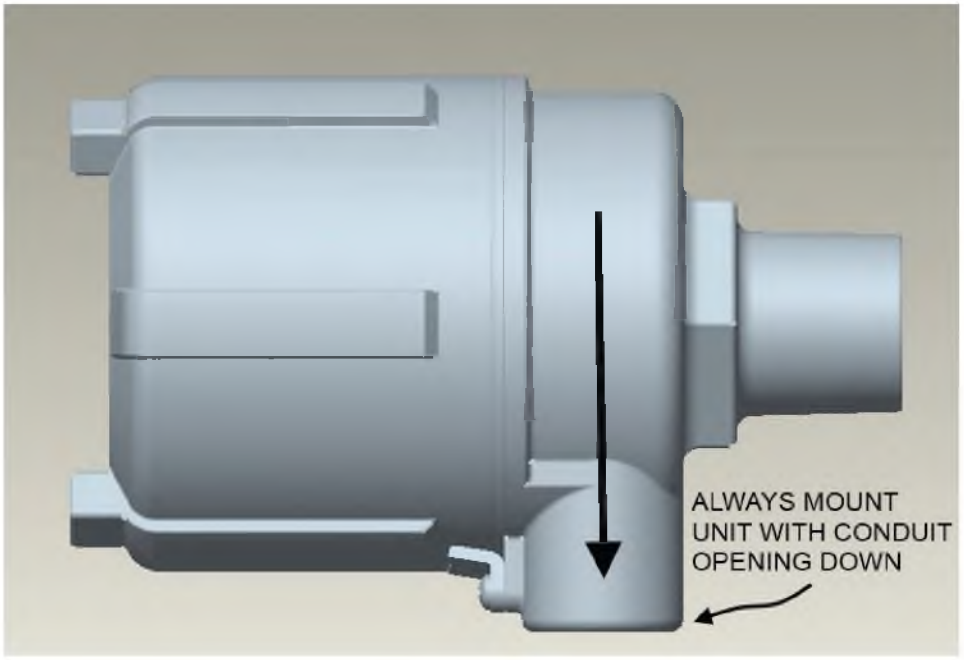


Figure 2

To summarize, the FD-2000 sensor should be installed such that:

- Its temperature rating is not exceeded
- Its pressure rating is not exceeded
- It does not experience excessive vibration
- An opening is provided in metallic shoots or pipes
- If necessary, mounted off perpendicular to material flow
- Always mount conduit openings down and, if necessary, use duct seal

Connections and Wiring

Terminals are available for the following connections:

- 24 VDC
- 4-20 mA
- OUT
- FAULT

These terminals are accessible by unscrewing the enclosure cover. All wiring should be fed from the outside, through the conduit openings. Terminal labels are printed directly above the terminals on the control plate as seen in Figure 3.

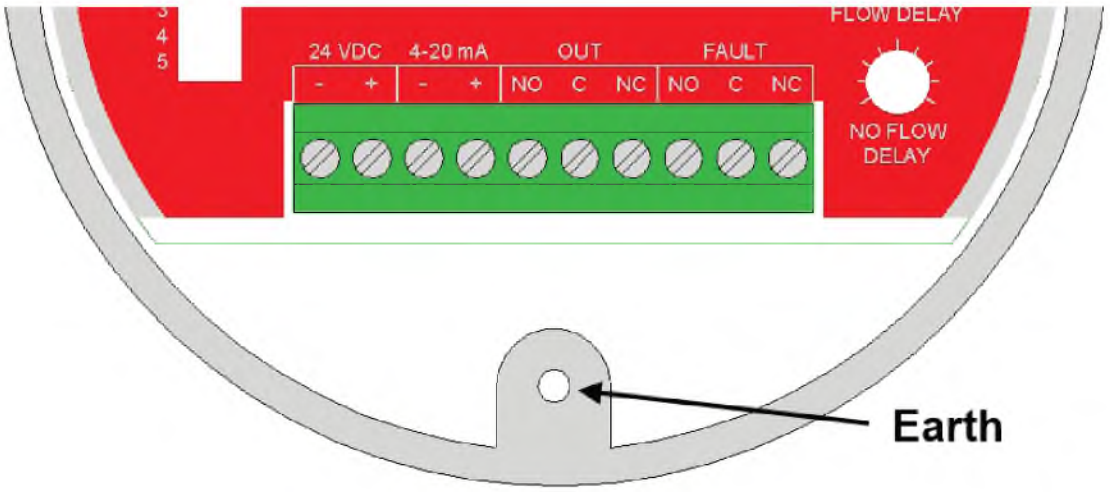


Figure 3

24 VDC

The FD-2000 requires about 2.0 watts of power from a 24 VDC +/-10% source. Refer to Figure 3 for location of these two terminals. Connect the negative of the 24 VDC power source to the far left terminal labeled with the minus sign. Connect the positive to the terminal labeled with the plus sign. A good earth should also be connected at the screw terminal on the inside of the enclosure.

4-20 mA

This is a powered or active current output and can drive up to 650 ohms. Refer to Figure 3 for location of these two terminals. Connect the negative wire coming from the current receiver to the terminal labeled with the minus sign. Connect the positive wire coming from the current receiver to the terminal labeled with the plus sign.

OUT and FAULT

Each of the OUT and FAULT terminals offer an SPDT relay which provides dry contacts for operation of external controls or equipment. Terminal connections are available for the common (C), the normally open (NO) and the normally closed contacts (NC). Refer to Figure 3 for location of these terminals. The relay contacts are rated for 2A at up to 250 VAC or 220 VDC.

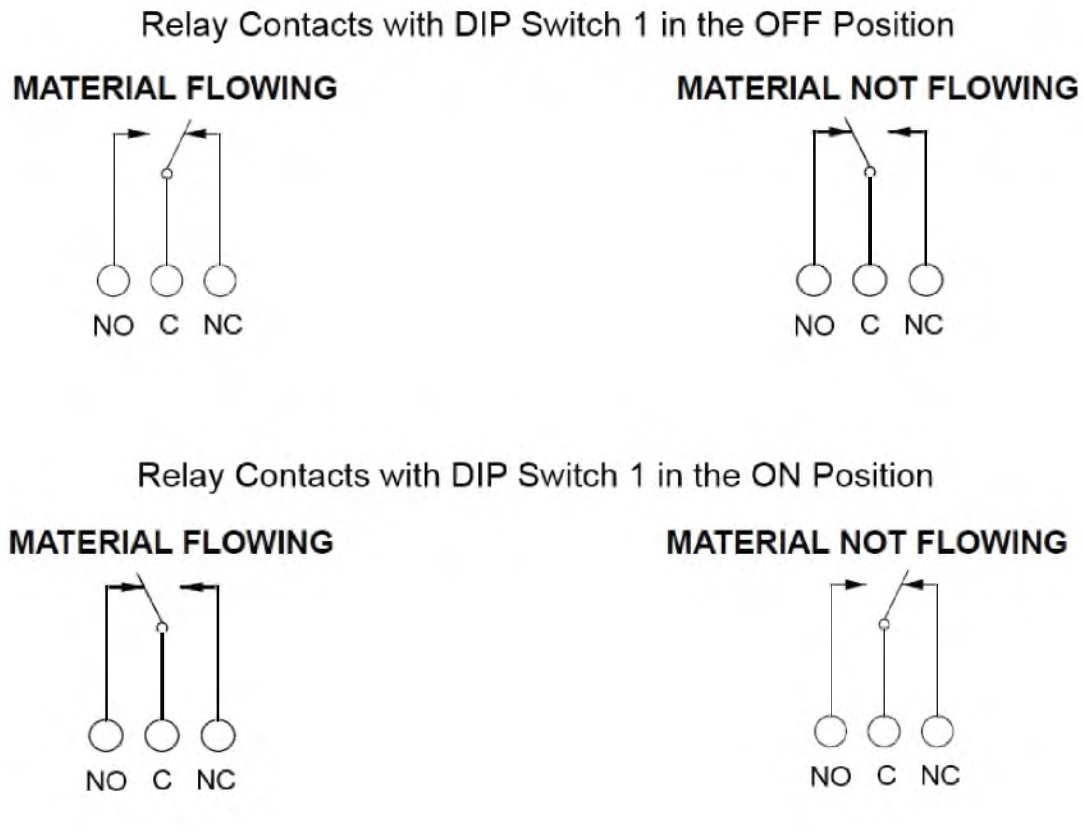


Figure 4

Controls and Indicators

All user controls and indicators are visible by removing the enclosure cover. Refer to Figure 5 for location of the controls and indicators.

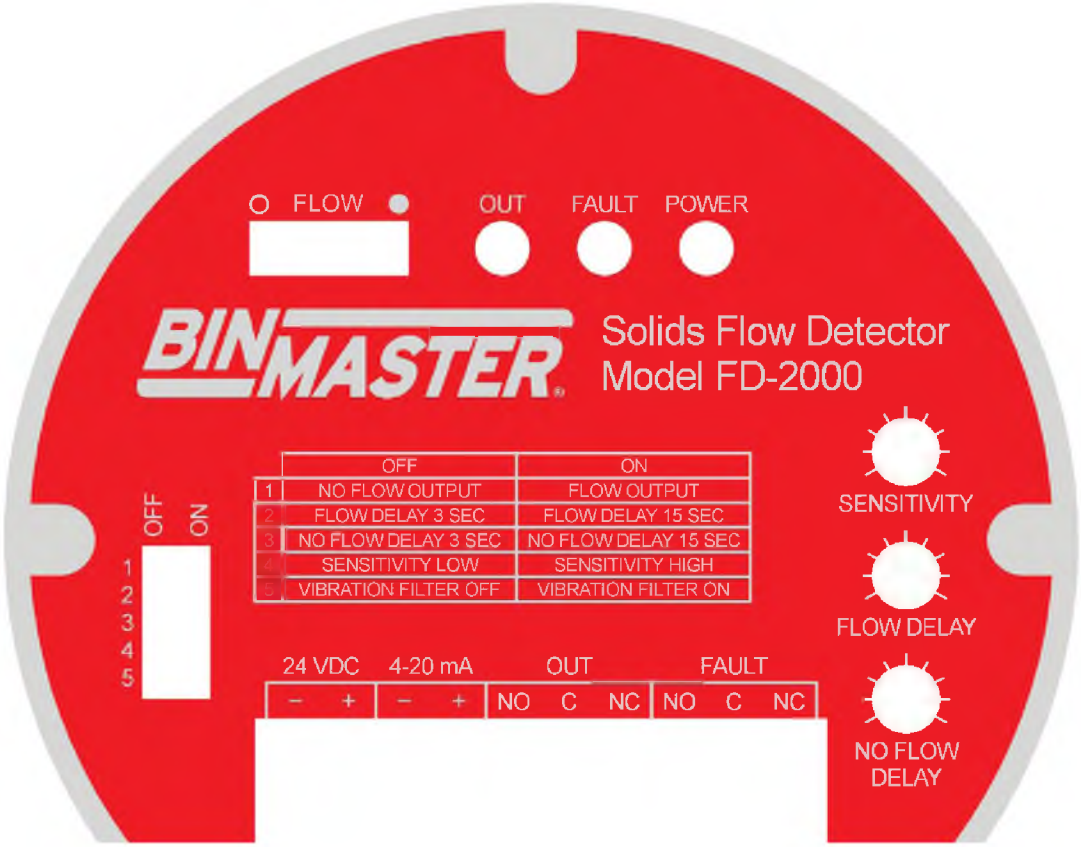


Figure 5

Following is a list of controls and indicators available:

FLOW Indicator – This is to assist in adjusting the sensitivity by indicating the margin between the no-flow and flow conditions. It consists of five multi-colored LEDs, with a red one in the center representing the trip point between flow and no-flow. Indication to the left is no-flow and to the right is flow.

OUT Indicator – This is a yellow LED and will indicate the Flow or No Flow output condition, which corresponds directly with the OUT relay and 4-20mA output current. When the OUT indicator is off, the OUT relay is de-energized and the current output is at 4mA. When the OUT indicator is on, the OUT relay is energized and the current output is at 20mA.

FAULT Indicator – This is a red LED and will indicate if the OUT condition is not guaranteed to be valid; such as when the unit is operating near or outside its rated temperature range or when the internal Doppler sensing element is faulty. This indicator corresponds directly with

the FAULT relay. When the FAULT indicator is off, the FAULT relay is de-energized. When the FAULT indicator is on, the FAULT relay is energized. Also, the 4-20mA current output will be at 22mA when in the FAULT condition.

POWER Indicator – This is a green LED and simply indicates when power is applied to the unit.

SENSITIVITY Control – This is used to adjust the sensitivity or detection range of the unit.

FLOW DELAY Control – This is used to adjust the delay from when material has started to flow to when the OUT relay and indicator are switched.

NO FLOW DELAY Control – This is used to adjust the delay from when material has stopped flowing to when the OUT relay and indictor are switched.

DIP Switches

Switch 1 (NO FLOW OUTPUT / FLOW OUTPUT) – For selecting between a no-flow or flow output condition. The OUT relay will be energized and the OUT indicator will be on based on this selection. Slide the switch to the off position for a no flow output. Slide the switch to the on position for a flow output.

Switch 2 (FLOW DELAY 3 SEC / FLOW DELAY 15 SEC) – For selecting the desired flow delay range. Slide the switch to the off position for an on delay range of 0.1 to 3.1 seconds. Slide the switch to the on position for a range of 2.3 to 15.1 seconds.

Switch 3 (NO FLOW DELAY 3 SEC / NO FLOW DELAY 15 SEC) – For selecting the desired no flow delay range. Slide the switch to the off position for an off delay range of 0.1 to 3.1 seconds. Slide the switch to the on position for a range of 2.3 to 15.1 seconds.

Switch 4 (SENSITIVITY LOW / SENSITIVITY HIGH) – For selecting the sensitivity or detection range of the unit. Slide this switch to the off position for low sensitivity or when the moving target will be near the unit. Slide this switch to the on position for high sensitivity or when the target will be far from the unit.

Switch 5 (VIBRATION FILTER OFF / VIBRATION FILTER ON) – For enabling or disabling the vibration filter, which will eliminate undesirable signals from vibrating equipment. Slide this switch to the off position to turn the filter off. Slide this switch to the on position to turn the filter on.

Calibration Procedure

With the sensor mounted in position and wired, unscrew the enclosure cover to expose the control plate. Then follow these steps:

1. Start with the DIP switches set as follows:
    a. Switch 1 on for a FLOW OUTPUT.
    b. Switch 2 off for FLOW DELAY 3 SEC.
    c. Switch 3 off for NO FLOW DELAY 3 SEC.
    d. Switch 4 off for SENSITIVITY LOW.
    e. Switch 5 off for VIBRATION FILTER OFF.

2. Turn the SENSITIVITY, FLOW DELAY and NO FLOW DELAY controls fully counter clock-wise for their minimum setting.

3. With no material flowing (the OUT indicator should be off), slowly turn the SENSITIVITY control clock-wise until the OUT indicator turns on or until the control is at maximum. Note the actuating point for the no-flow condition.

4. Start material flowing and slowly turn the SENSITIVITY control counter clock-wise until the OUT indicator just turns off. Note the actuating point for the flow condition.

5. Turn the SENSITIVITY control midway between the no-flow and flow actuating points. If vibration is causing unwanted detection or increases the receiving level of the no-flow condition, then set DIP switch 5 to VIBRATION FILTER ON and repeat steps 2 to 5. If the flowing material is not detectable or there is very little margin between the no-flow and flow actuating points, then set DIP switch 4 to SENSITIVITY HIGH and repeat steps 2 to 5.

6. In order to detect irregular flow, set DIP switch 2 and adjust the FLOW DELAY control as needed.

7. In order to not detect irregular flow, set DIP switch 3 and adjust the NO FLOW DELAY control as needed.

8. If the desired output is for indication of no flow, then you can set DIP switch 1 for NO FLOW OUTPUT.

LIMITED WARRANTY

Garner Industries warrants this product against defects in material and workmanship for two (2) years according to the following terms;

1.) This warranty extends to the original purchaser only and commences on the date of original purchase.

2.) Garner Industries sole obligation under said warranty is to repair, or at its option replace the defective parts. The buyer shall have no other remedy. All special, incidental and consequential damages are excluded. The buyer must deliver the product under warranty prepaid to the factory. Garner Industries obligation is limited to the cost of material and labor to repair or replace, and does not include transportation expenses.

3.) This warranty shall be voided, in our sole judgment, by alterations of equipment except by Garner Industries, or tampering with, improper installation or maintenance, accident or misuse, or act of God. This warranty expressly excludes all damage to the product resulting from careless or neglectful packaging or transportation. The warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied including any implied warranties or merchantability or fitness for particular purpose. No employee, agent, franchise dealer or other person is authorized to give any warranties of any nature on behalf of Garner Industries.

5) Garner Industries shall in no event be responsible for any warranty work done without first obtaining Garner Industries written consent.

6) Except as provided herein, Garner Industries shall have no liability, loss or damage caused or alleged to be caused directly or indirectly by this equipment.

7) This warranty gives the buyer specific legal rights, and you may also have other rights which vary from state to state.

8) For service, please call 402-434-9102.

Declaration of Conformity

BinMaster declares that all models of the FD-2000 flow sensor devices as listed below comply with the following directives and harmonized standards. This product if installed, operated and maintained as described in this manual will provide a safe and reliable bulk solids flow / no flow sensor for a variety of materials.

EMC Directive 2004/108/EC
Standard EN 61326-1:2006

Product: Solids flow sensor
Models: FD-2000

All test reports and documentation are held and can be obtained from BinMaster.

Manufacturing Location: Lincoln, Nebraska, USA

Price $5.00

BINMASTER®

Taking Control . . .To A Higher Level

PRO REMOTE 25 LV
CAPACITANCE PROBE

OPERATING INSTRUCTIONS

READ THOROUGHLY BEFORE INSTALLING EQUIPMENT

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BINMASTER®

Taking Control...To A Higher Level

PRO REMOTE 25 LV
GENERAL SPECIFICATIONS

Supply:	12 TO 24 Volts AC/DC
Load:	1.5VA
Ambient Temperature: (Electronics)	-20° F to +160° F (-30° C to +70° C)
Sensitivity:	1 picofarad
Enclosure:	Type 4X, 5, 12
Relay Output:	DPDT contacts; 5 Amps 250 VAC
Fail-Safe:	Switch selectable "High" or "Low" level modes
Calibration:	Set when probe is uncovered: COARSE adjust; single turn potentiometer FINE adjust; single turn potentiometer
Status Indicator:	Internal LED indicates material in contact with probe.
Time Delay:	Adjustable from 1 to 15 seconds
Probe Shield:	Automatically compensates for material buildupon the probe
Conduit Entry:	3/4" NPT

1.0 INTRODUCTION

The Bin-Master PRO REMOTE 25 LV is a two piece point level control used to detect the presence or absence of liquids or granular solids. The PRO REMOTE 25 LV operates on the capacitance principle and incorporates a "Quick Set" feature to simplify calibration. The PRO REMOTE 25 LV includes switch selectable Fail-Safe output contacts and "Probe Shield" technology for ignoring material build-up.

The PRO REMOTE 25 LV **does not** use RF and therefore **does not** interfere with nor is susceptible to interference from other devices.

Upon installation the PRO REMOTE 25 LV is set up with the probe uncovered. The "Quick Set" feature allows simple setup and calibration of the unit to achieve low, medium, or high sensitivity settings. The PRO REMOTE 25 LV has an adjustable time delay of relay output for covered or uncovered conditions.

2.0 APPLICATIONS

2.1 The PRO REMOTE 25 LV electronics can be powered from a low voltage AC or DC supply. The supply voltage must be between 12 to 24 volts.

2.2 For applications in pressurized vessels up to 1500 PSI, the PRO REMOTE 25 LV should be mounted with the 3/4" stainless steel coupling.

2.3 Application temperatures for the various probes are:

1. Delrin Sleeved Stainless Steel: ....250 Deg. F
2. Teflon Sleeved Stainless Steel: ....500 Deg. F
3. Flush Mount (Polyethylene): .....180 Deg. F
4. Flush Mount (Teflon): .....450 Deg. F

3.0 INSTALLATION

3.1 Location and Mounting

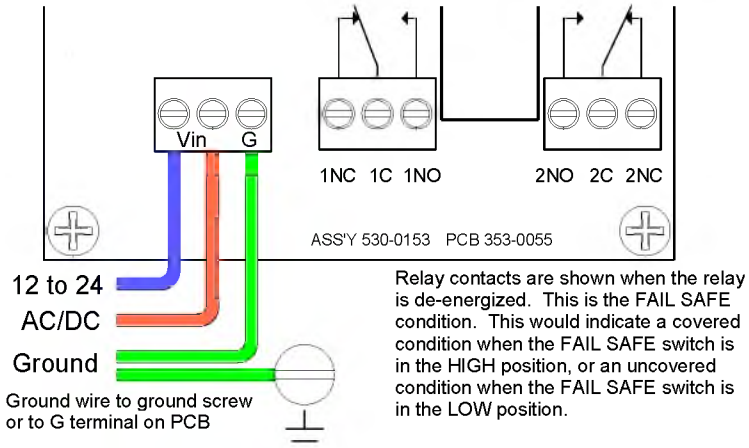
The PRO REMOTE PROBE HEAD is designed to mount utilizing either a standard 1- 1/4" NPT coupling or optional 3/4" NPT coupling. When the PROBE HEAD is used with the flush mount probe, the flush mount probe mounts directly to the vessel wall using a 7" diameter bolt circle. Refer to Figures 1.1 through 1.4 for illustrations on installation, mounting options, and different probe combinations.

The PROBE HEAD should be mounted in a position such that the probe itself is not in the direct flow of material.

The vessel on which the PRO REMOTE PROBE HEAD is mounted must be made of metal which acts as part of the capacitive environment. If the vessel is not metal, a suitable metal plate must be installed with the Remote Probe Head.

3.2 Input Power and Field Wiring

The PRO REMOTE 25 LV is available to operate from a low voltage AC or DC supply. The input voltage must be between 12 to 24 volts. The polarity of the supply voltage does not matter. Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation..



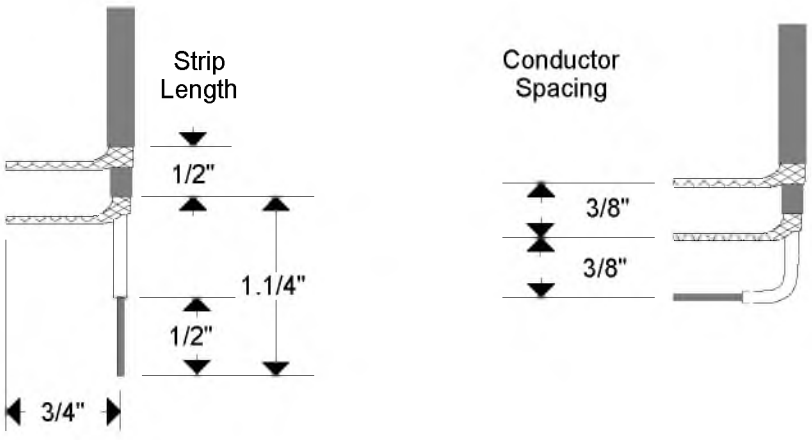
3.3 Wiring between Probe Head and Electronic Console

The remote probe is connected to the electronics with a triaxial cable at least 10 feet but not more than 25 feet long. Beldon number 8232 or Alpha number 9850 cable is recommended. The electronics end of the cable is prepared at the factory and should be connected as shown in Figure 1.5 on page 13. The Brown wire connects to the Center Wire terminal, The Blue wire connects to the Inner Shld terminal, and the Green wire connects to the Outer Shld terminal.

The probe head end of the cable should be prepared as shown below. Connect each shield and the center conductor to the appropriate terminal as shown in Figure 1.5. Be sure that there are no loose strands that could short to another terminal or conductor.

NOTE: Place the cable strain relief nut and rubber grommet on the triax cable before preparing the ends of the cable.

Strip the outer jacket off 1 3/4 inches away from the end of the cable. Unbraid the strands of the outer shield and then twist them together. Strip the inner teflon jacket off 1 1/2 inches away from the end of the cable. Unbraid the strands of the inner shield and them twist them together. Cut both shields so that they are 3/4 inch long. Strip 1/2 inch of the insulation off of the inner conductor. Each shield and the center conductor should be spaced 3/8 inch apart as shown.



4.0 FAIL-SAFE SELECTION

4.1 Description

A Fail-Safe condition means that the relay contact positions are set up so that in the event of a power failure, the relay will be de-energized and the contacts will indicate a condition that is deemed safe for the application. (Refer to FIGURE 2.1 for the location of the Fail-Safe selection switch.)

4.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is covered whether it is or not.

FAIL SAFE "HIGH" RELAY CONTACT POSITION

4.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the probe is uncovered and will energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is uncovered whether it is or not.

FAIL SAFE "LOW" RELAY CONTACT POSITION

5.0 CALIBRATION

The PRO REMOTE 25 LV Quick Set calibration feature uses two single turn potentiometers making calibration very simple. One potentiometer labeled COARSE is used to compensate for the capacitance of the empty vessel. The other potentiometer labeled FINE is used to set in the desired sensitivity. Refer to FIGURE 2.1 for the location of these potentiometers on the printed circuit board.

NOTE:The COARSE and FINE potentiometers are delicate electronic components. Do not use excessive force when adjusting them.

NOTE: Accurate calibration requires that the appropriate probe be attached to the PRO REMOTE PROBE HEAD and the unit installed in the vessel. The probe must be UNCOVERED and material well below it.

5.1 Calibration Verification

Following calibration adjustment, the sensitivity setting that you have selected should be checked by verifying that the PRO REMOTE 25 LV senses a covered probe condition with your material.

5.2 Calibration Procedure

NOTE:*Do not use excessive force when adjusting the COARSE and FINE potentiometers.*

1. Turn both the COARSE and FINE potentiometers fully counter clockwise (CCW). The internal COVERED indicator light should be OFF.

2. Turn the COARSE potentiometer slowly clockwise (CW) to the point where the COVERED indicator light just turns ON and stays on.

3. Turn the FINE potentiometer slowly clockwise (CW) until the COVERED indicator light just turns OFF. (If the COARSE potentiometer has been carefully adjusted, this should occur when the FINE potentiometer is between the 8 and 11 O'clock position.) Now continue to turn the FINE potentiometer clockwise (CW) to the desired sensitivity setting.

HIGH sensitivity: 1/16 turn
MEDIUM sensitivity: 1/8 turn
LOW sensitivity: 1/4 to 1/2 turn

5.3 Sensitivity Selection

Sensitivity Setting (typical)	**Dielectric Constant of Material**
HIGH sensitivity:	4 or less
MEDIUM sensitivity:	4 to 10
LOW sensitivity:	10 or higher

6.0 TIME DELAY

The PRO REMOTE has an adjustable time delay up to 15 seconds. This is a time delay for the output to change states from an uncovered to a covered condition and from a covered to an uncovered condition. This time delay affects the DPDT relay contacts. The internal LED (DS1) will immediately respond to a change in covered or uncovered condition regardless of the time delay setting.

Minimum time delay is when the DELAY potentiometer is set fully counter-clockwise. (Refer to FIGURE 2.1 for the location of the DELAY potentiometer.) Maximum time delay is with the DELAY potentiometer set fully clockwise.

NOTE:Do not use excessive force when adjusting the DELAY potentiometer.

7.0 WARRANTY AND CUSTOMER SERVICE

7.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

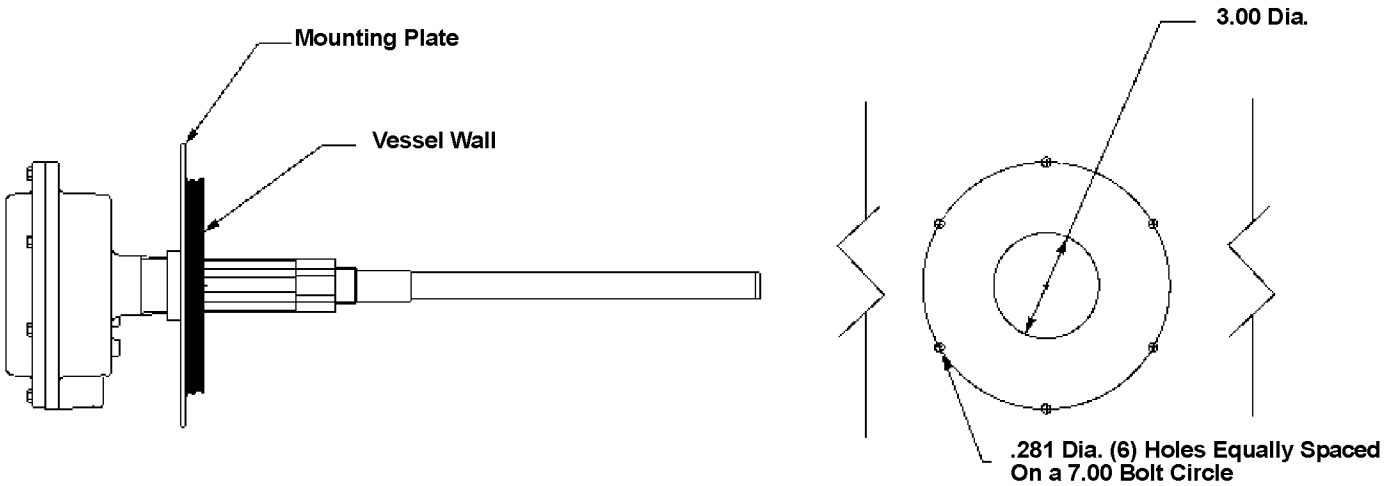
2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.) This warranty shall not apply to any product which has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear .

4.) This warranty is in lieu of all other warranties, expressed or implied.

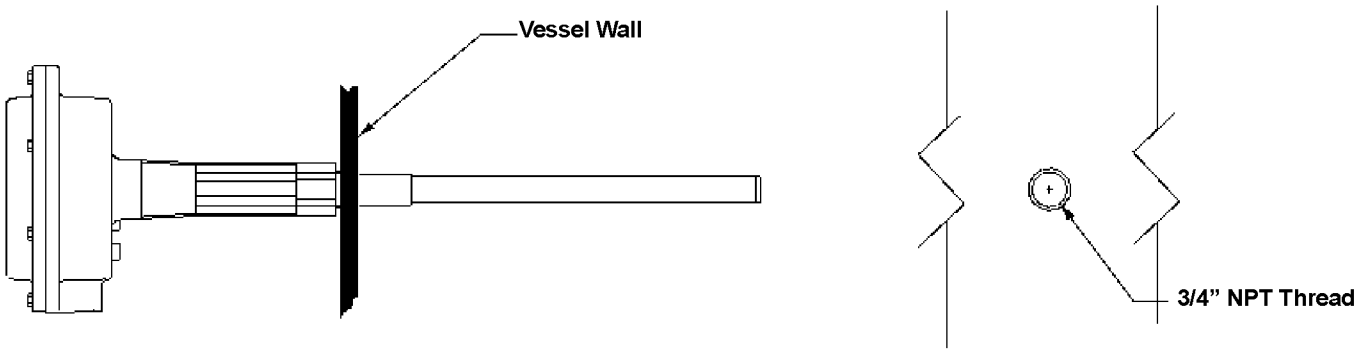
7.2 Customer Service

Bin Master offers a toll-free Customer Service phone number **1-800-278-4241**. You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00AM to 5:00PM Central Time. International customers call us at **(402) 434-9102** or reach us via fax at **(402) 434-9133.**



Standard Mounting Plate

Mounting Hole Pattern
In Vessel Wall



Explosion Proof
High Pressure Coupling

Mounting Hole
In Vessel Wall

9270061.dgn
927a061.tif

Figure 1.1

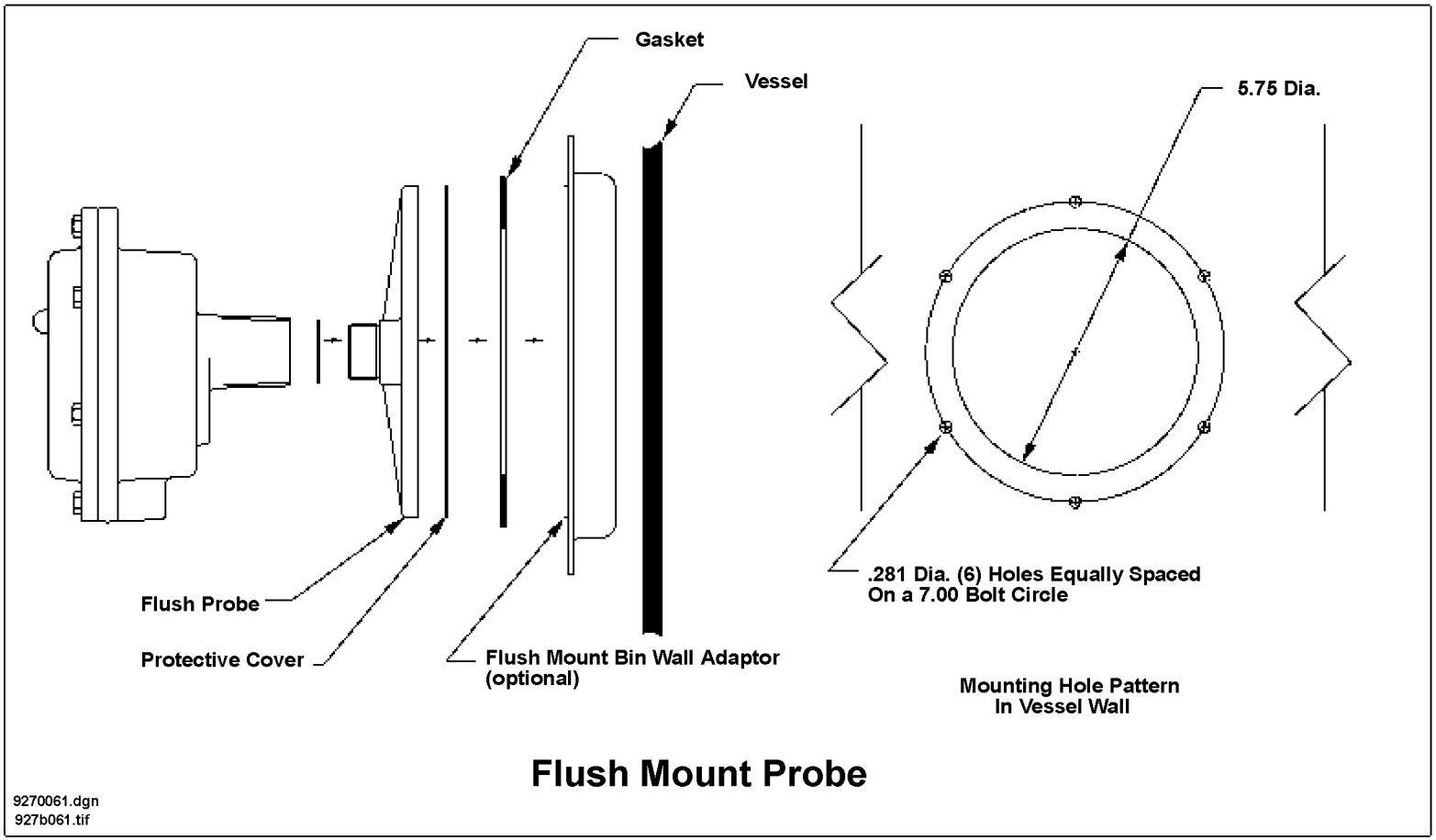

Gasket
Vessel
5.75 Dia.
Flush Probe
Protective Cover
Flush Mount Bin Wall Adaptor
(optional)
.281 Dia. (6) Holes Equally Spaced
On a 7.00 Bolt Circle
Mounting Hole Pattern
In Vessel Wall
Flush Mount Probe
9270061.dgn
927b061.tif

Figure 1.2

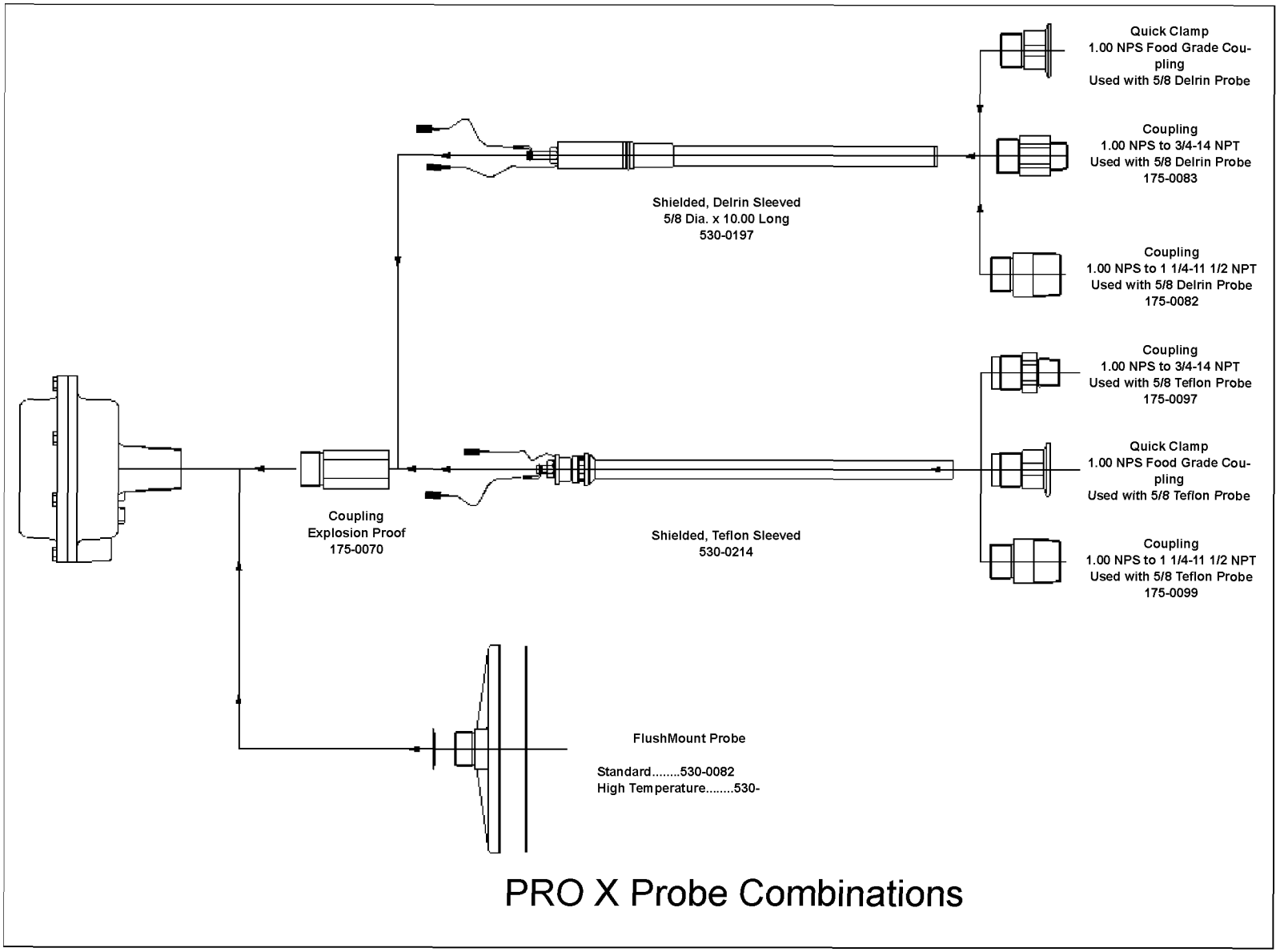
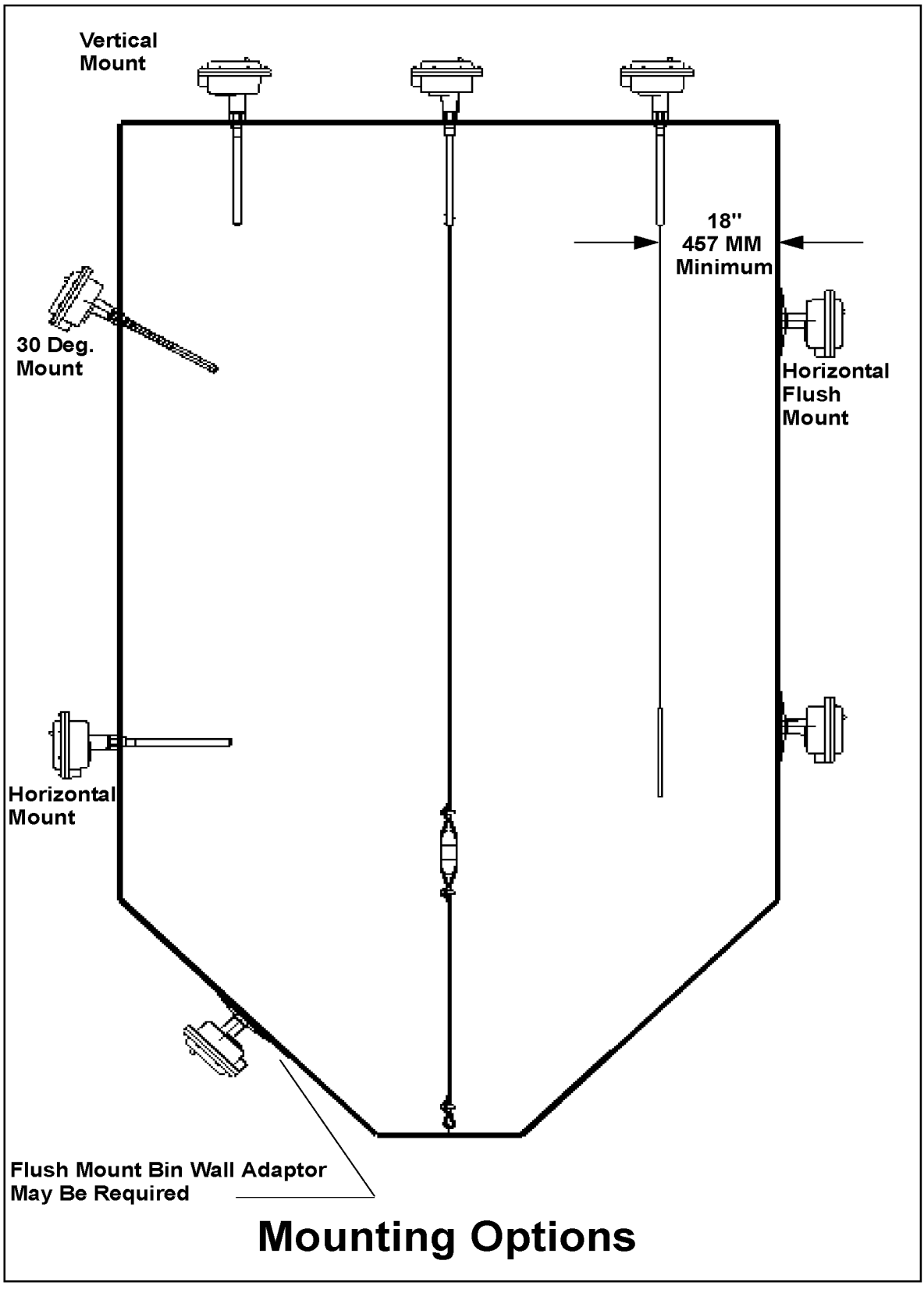

Quick Clamp
1.00 NPS Food Grade Coupling
Used with 5/8 Delrin Probe
Coupling
1.00 NPS to 3/4-14 NPT
Used with 5/8 Delrin Probe
175-0083
Shielded, Delrin Sleeved
5/8 Dia. x 10.00 Long
530-0197
Coupling
1.00 NPS to 1 1/4-11 1/2 NPT
Used with 5/8 Delrin Probe
175-0082
Coupling
1.00 NPS to 3/4-14 NPT
Used with 5/8 Teflon Probe
175-0097
Quick Clamp
1.00 NPS Food Grade Coupling
Used with 5/8 Teflon Probe
Coupling
Explosion Proof
175-0070
Shielded, Teflon Sleeved
530-0214
Coupling
1.00 NPS to 1 1/4-11 1/2 NPT
Used with 5/8 Teflon Probe
175-0099
FlushMount Probe
Standard.....530-0082
High Temperature.....530-
PRO X Probe Combinations

Figure 1.3



9270061.dgn
927c061.tif

Figure 1.4

9250146.fm

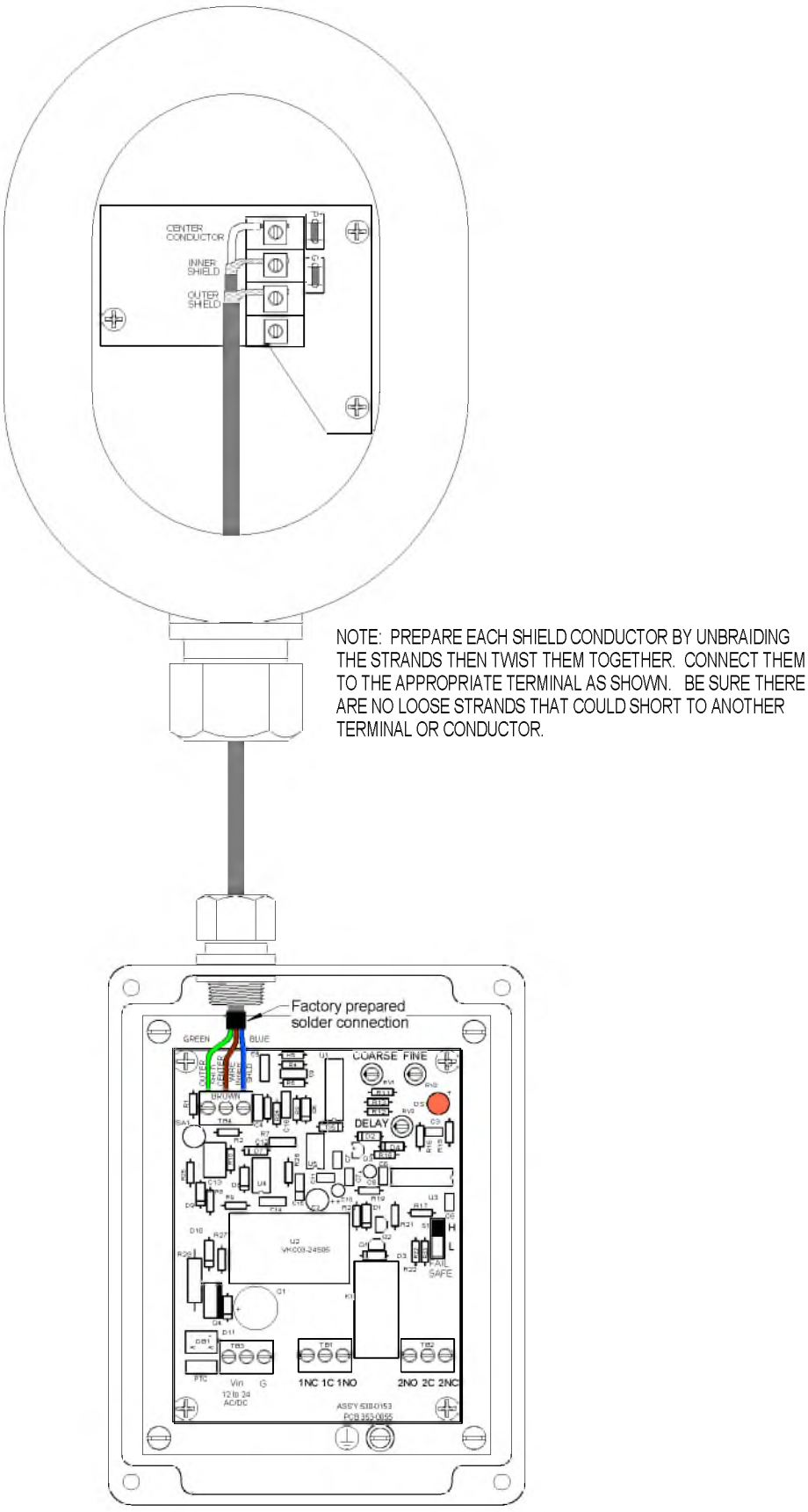

CENTER CONDUCTOR
INNER SHIELD
OUTER SHIELD
NOTE: PREPARE EACH SHIELD CONDUCTOR BY UNBRAIDING THE STRANDS THEN TWIST THEM TOGETHER. CONNECT THEM TO THE APPROPRIATE TERMINAL AS SHOWN. BE SURE THERE ARE NO LOOSE STRANDS THAT COULD SHORT TO ANOTHER TERMINAL OR CONDUCTOR.
Factory prepared solder connection
GREEN
BLUE
BROWN
COARSE
FINE
DELAY
H
L
FAIL SAFE
1NC 1C 1NO
2NO 2C 2NC
Vin
12 to 24 AC/DC

Figure 1.5

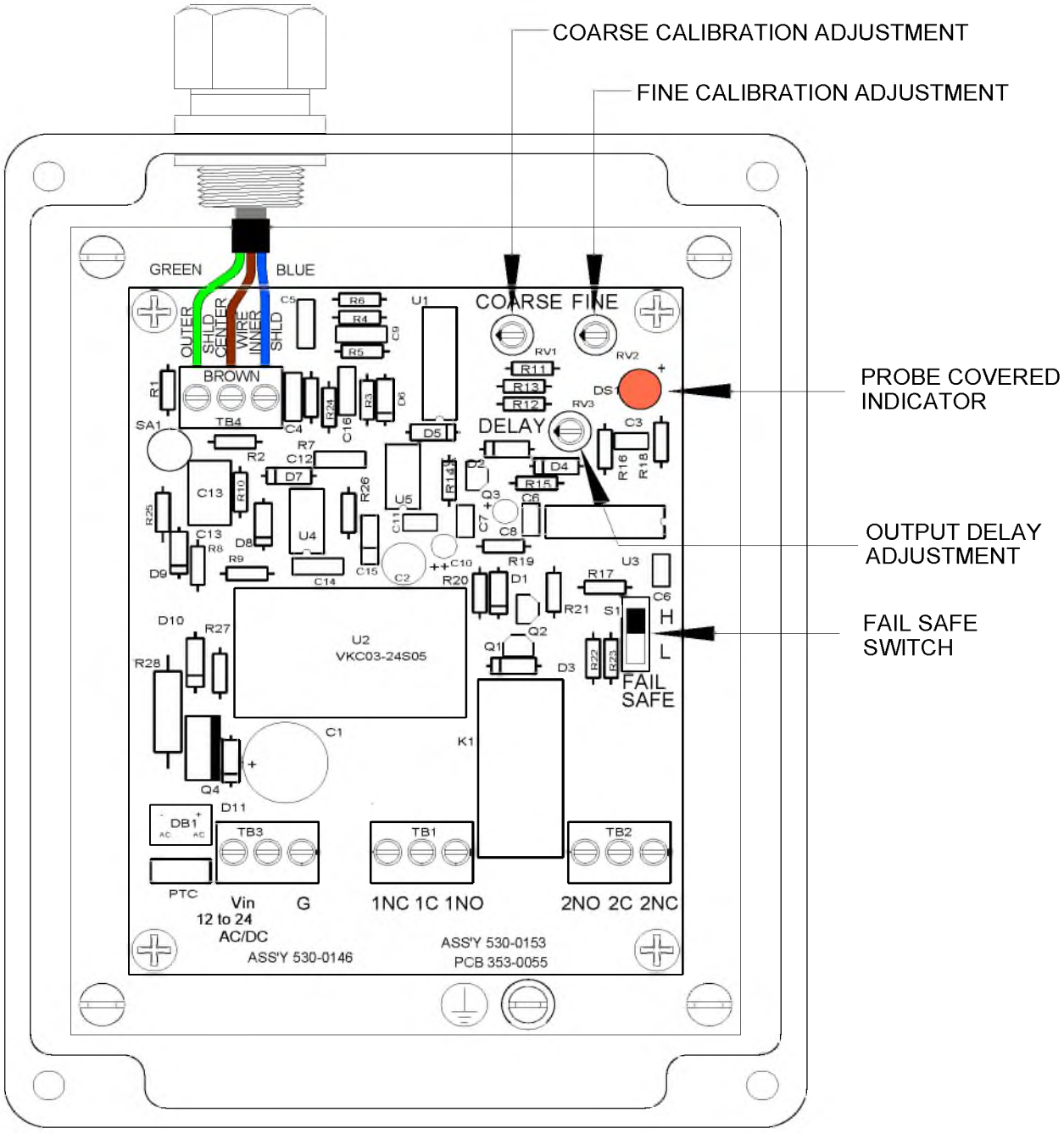
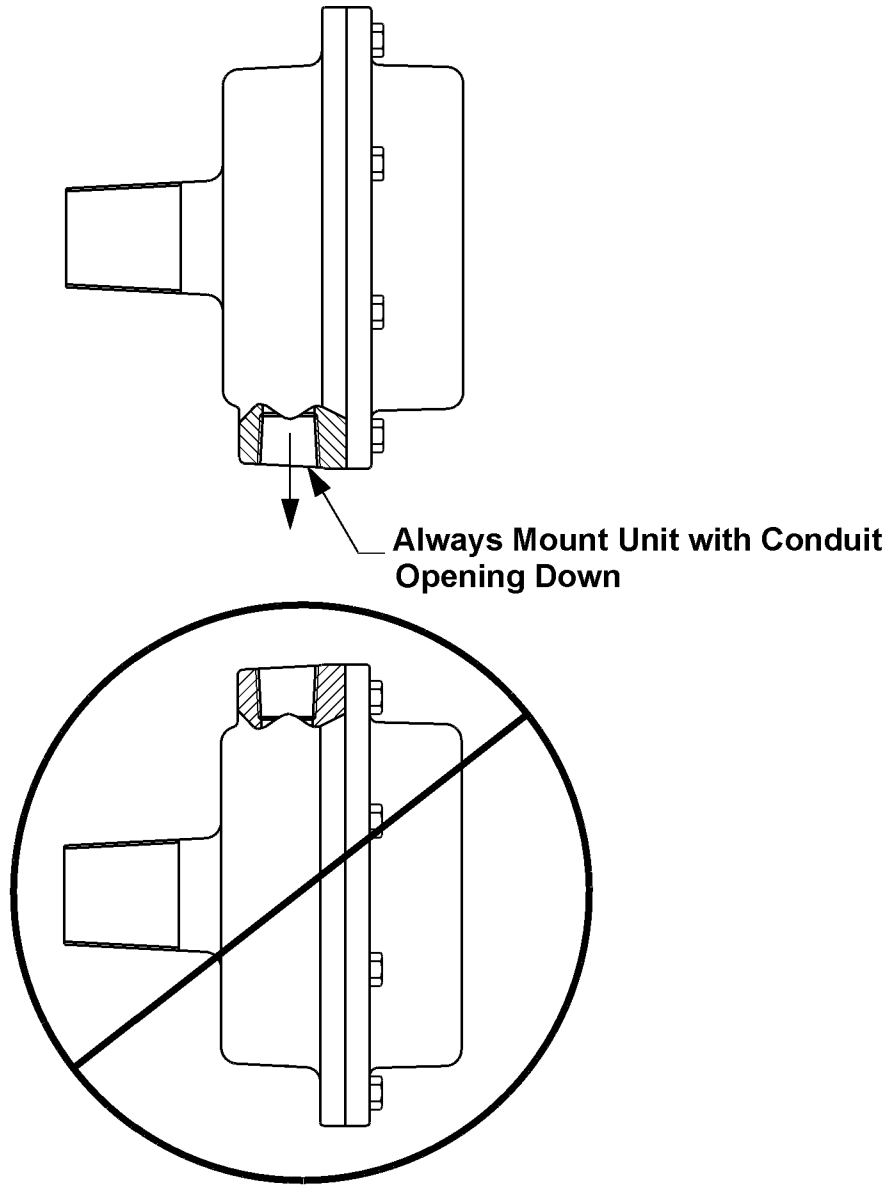

COARSE CALIBRATION ADJUSTMENT
FINE CALIBRATION ADJUSTMENT
PROBE COVERED INDICATOR
OUTPUT DELAY ADJUSTMENT
FAIL SAFE SWITCH
GREEN
BLUE
OUTER SHLD
CENTER WIRE
INNER SHLD
BROWN
COARSE FINE
DELAY
FAIL SAFE
H
L
U2
VKC03-24S05
Vin
12 to 24
AC/DC
G
1NC 1C 1NO
2NO 2C 2NC
ASS'Y 530-0146
ASS'Y 530-0153
PCB 353-0055

Figure 2.1

Mounting Instructions



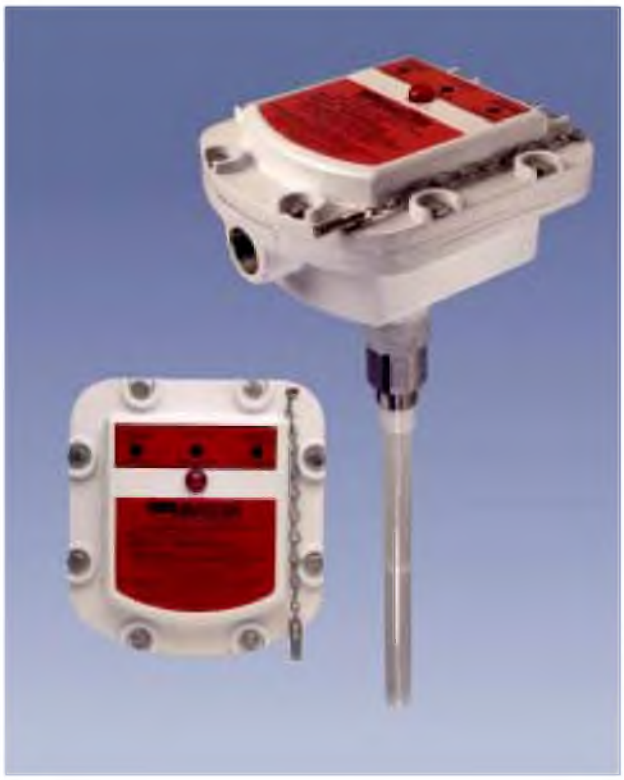
CONDUIT SEAL

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure thru the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

BINMASTER

Taking Control . . .To A Higher Level

PRO AUTO-CAL LV
CAPACITANCE PROBE



OPERATING INSTRUCTIONS
PLEASE READ CAREFULLY

9250148.fm

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

SUPPLY	12 to 24 VDC or VAC 2VA
AMBIENT TEMPERATURE (Electronics)	-40°F to +160°F (-40°C to +70°C)
SENSITIVITY	Less than 1 picofarad
ENCLOSURE	Type 4X, 5, 12
RELAY OUTPUT	DPDT contacts; 5 Amp 250 VAC rating
FAIL-SAFE	Switch selectable "High" or "Low" level
CALIBRATION	Automatic calibration, manually activated OR Through cover activation with magnetic wand. Five selectable sensitivity offset values
STATUS INDICATORS	Internal LED indicates material in contact with probe: ON = Probe covered External LED, includes the time delay setting: Slowly Flashing = Probe uncovered ON Steady = Probe covered OFF Steady = Power failure Quick Flashes with Pause = Calibration fault
OUTPUT RELAY TIME DELAY	Continuously adjustable up to 10 seconds
TEST FEATURES	Through cover tests with magnetic wand: Simulate Covered Probe Simulate Uncovered Probe
PROBE SHEILD	Automatically compensates for material buildup on the probe
CONDUIT ENTRY	3/4" NPT

1.0 INTRODUCTION

The Bin-Master PRO AUTO-CAL is a point level control used to detect the presence or absence of solids or liquids. The PRO AUTO-CAL operates on the capacitance principle and incorporates an embedded microprocessor which controls the automatic calibrate feature. The PRO AUTO-CAL includes switch selectable Fail-Safe relay output contacts, adjustable time delay of relay operation, "Probe Shield" technology for ignoring material build-up, and through the cover full operational testing. An external LED provides visual monitoring of probe covered, uncovered, auto-calibration, or power failure conditions.

Upon installation, the PRO AUTO-CAL is calibrated with the probe uncovered. The automatic calibrate feature allows push button or through the cover calibration of the unit. Five internal selectable sensitivity offsets permit reliable detection of a wide range of materials.

2.0 APPLICATIONS

For applications in pressurized vessels up to 1500 PSI, the PRO AUTO-CAL should be mounted with the 3/4" stainless steel coupling.

Application temperatures for the various probes are:

1. Delrin Sleeved Stainless Steel: 250°F
2. Teflon Sleeved Stainless Steel: 500°F
3. Flush Mount (Polyethylene): 180°F
4. Flush Mount (Teflon): 450°F
5. Bare Stainless Steel: 250°F
6. Flexible Extension: 250°F

The Delrin and Teflon sleeved stainless steel probe should be used for most applications. A bare metal stainless steel probe can be used in certain granular or liquid materials that are not electrically conductive. For electrically conductive material, a coated (insulated) probe must be used. Conductive material, which completely coats the probe, will render the unit inoperative. This is true for any capacitance probe.

NOTE: The temperature of the electronics within the enclosure must not exceed 160°F. Use of high temperature probes may require lagging the electronics away from the heat source.

3.0 INSTALLATION

3.1 Location and Mounting

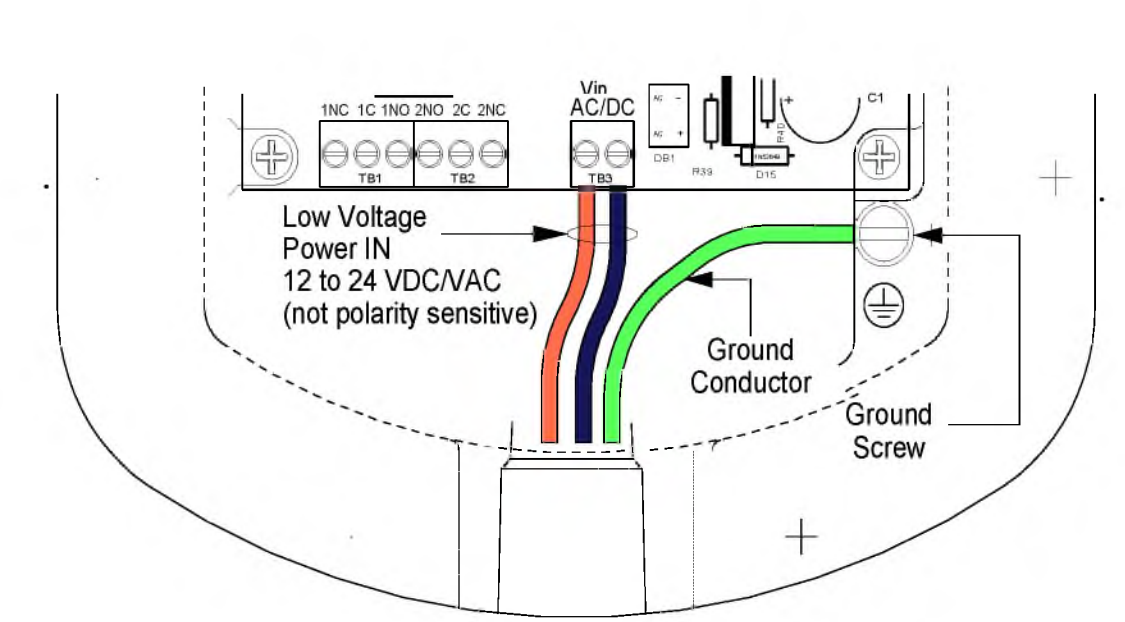
The probe should be located out of the direct flow of material. The PRO AUTO-CAL is designed to mount utilizing either a standard 3/4" NPT coupling or optional 1 1/4" NPT coupling. When the PRO AUTO-CAL is used with the flush mount probe, the flush mount probe mounts directly to the vessel wall using a 7" diameter bolt circle. Refer to Figures 1.1 through 1.4 for illustrations on installation, mounting options, and different probe combinations.

When the PRO AUTO-CAL is used with a probe that does not have a guard shield, care should be taken if mounted in a stand pipe or through a thick vessel wall. Close proximity between the standpipe or vessel walls and the probe rod can produce an ambient capacitance that is high enough to exceed the calibration range of the PRO ATUO-CAL. If you have any questions about the installation consult your BinMaster representitive or the BinMaster factory.

3.2 Input Power and Field Wiring

The PRO AUTO-CAL LV is be powered from a low voltage VDC or VAC supply (see diagram below). Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation.

POWER SUPPLY WIRING CONNECTIONS



3.3 Grounding

An equipment grounding connection (earth ground) **must** be supplied to the unit for safety and to insure proper operation of the unit. This unit uses earth ground as a reference for calibration and detecting a covered or uncovered condition. Therefore, the vessel in which the PRO AUTO-CAL LV is mounted must be made of metal, or a suitable metal ground plate must be installed where the PRO AUTO-CAL LV is mounted.

4.0 FAIL-SAFE SELECTION

4.1 Description

A Fail-Safe condition means that the output relay contact positions are set up so that in the event of a power failure, which causes the relay to de-energize, the contacts will indicate a condition that is deemed safe for the application. (Refer to FIGURE 2.1 for the location of the Fail-Safe selection switch.)

4.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is covered whether it is or not.

FAIL SAFE "HIGH" RELAY CONTACT POSITION

4.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the probe is uncovered and will energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is uncovered whether it is or not.

FAIL SAFE "LOW" RELAY CONTACT POSITION

5.0 CALIBRATION

The automatic calibrate feature can be activated with the enclosure cover removed by use of an internal push button, or with the cover in place, by use of a magnetic wand. Before activating the automatic calibration cycle, the desired **sensitivity** offset must be selected internally. There are 5 sensitivity offset values, selectable with a 3 pole DIP switch, refer to paragraph 5.3.

IMPORTANT: The desired Sensitivity setting must be selected using the internal 3 pole SENSITIVITY switch **before** the Automatic Calibration cycle is activated. To program in a new sensitivity setting, the Automatic Calibration cycle must be activated **each time** a new setting is set on the SENSITIVITY switches

NOTE: Accurate calibration requires that the appropriate probe be attached to the PRO AUTO-CAL and the unit is installed in the vessel. The probe must be UNCOVERED with material well below it.

5.1 Calibration Verification

Following calibration, verify that the sensitivity setting you have selected is correct for your application. Material should be brought up to the probe level to confirm that the PRO AUTO-CAL senses a covered condition.

5.2 Calibration Procedure

NOTE: Material should be at least three (3) feet below the probe when calibrating.

1. Set the sensitivity switch to the desired sensitivity, see para 5.3 below.

2. If the enclosure cover is off, push the CALIBRATE button three times.

3. If the enclosure cover is on, touch the magnetic wand to the CALIBRATE target slowly three times. lift the wand at least 3/4 inch above the cover between each touch.

NOTE:

When the automatic calibration cycle is activated, the flashing LED will turn off for approximately 6 seconds to indicate that calibration is taking place. When the calibration is completed, the LED will again flash at a **slow steady rate**. Failure to calibrate gives quick flashes with a pause between, see paragraph 5.4.

5.3 Sensitivity Selection

Sensitivity Setting	DIP Switches	Dielectric Constant of Material
HIGH	HIGH switch only ON	1.2 to 2
MED. HIGH	HIGH and MED. switches both ON	2 to 4
MEDIUM	MED. switch only ON	4 or greater
MED. LOW	MED. and LOW switches both ON	10 or greater
LOW	LOW switch only ON	20 or greater

5.4 Failed Calibration Indication

Two, three or four quick flashes of the LED followed by a pause indicates that the unit failed to calibrate properly. The PRO AUTO-CAL has built-in diagnostics. If during the automatic calibrate cycle the PRO AUTO-CAL cannot properly achieve calibration, due to a problem with the probe or internal wiring, the LED indicator will not return to slow steady flashing after the 6 second off period. Rather, the LED will give a repeating sequence of short quick flashes followed by an off pause. In such a case, check the probe and its connecting wires for a short. **Do not** rely on the unit for your plant process when it is indicating a failed calibration condition.

6.0 TIME DELAY

The PRO AUTO-CAL has an adjustable time delay of 1/2 to 10 seconds for the output relay. This time delay is for the output to change states from either an uncovered to a covered condition or from a covered to an uncovered condition. This time delay affects the relay contacts and the flashing LED only. The internal LED (DS1) always responds immediately to a change in covered or uncovered condition, regardless of the time delay setting.

Minimum time delay is when the DELAY potentiometer is set fully counter-clockwise. (Refer to FIGURE XX for the location of the DELAY potentiometer.) Maximum time delay is with the DELAY potentiometer set fully clockwise.

CAUTION: This is a delicate electronic adjustment, do not use excess force, care should be taken so as not to turn the control past its stop when making adjustments.

7.0 WARRANTY AND CUSTOMER SERVICE

7.1 Limited Warranty

The manufacturer warrants this equipment for 2 years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the **Warranty Registration** card to confirm the equipment purchase. Failure to do so may void the warranty.

2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.) This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied.

7.2 Customer Service

Bin Master offers a toll-free Customer Service phone number **1-800-278-4241.** You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via fax at (402) 434-9133.

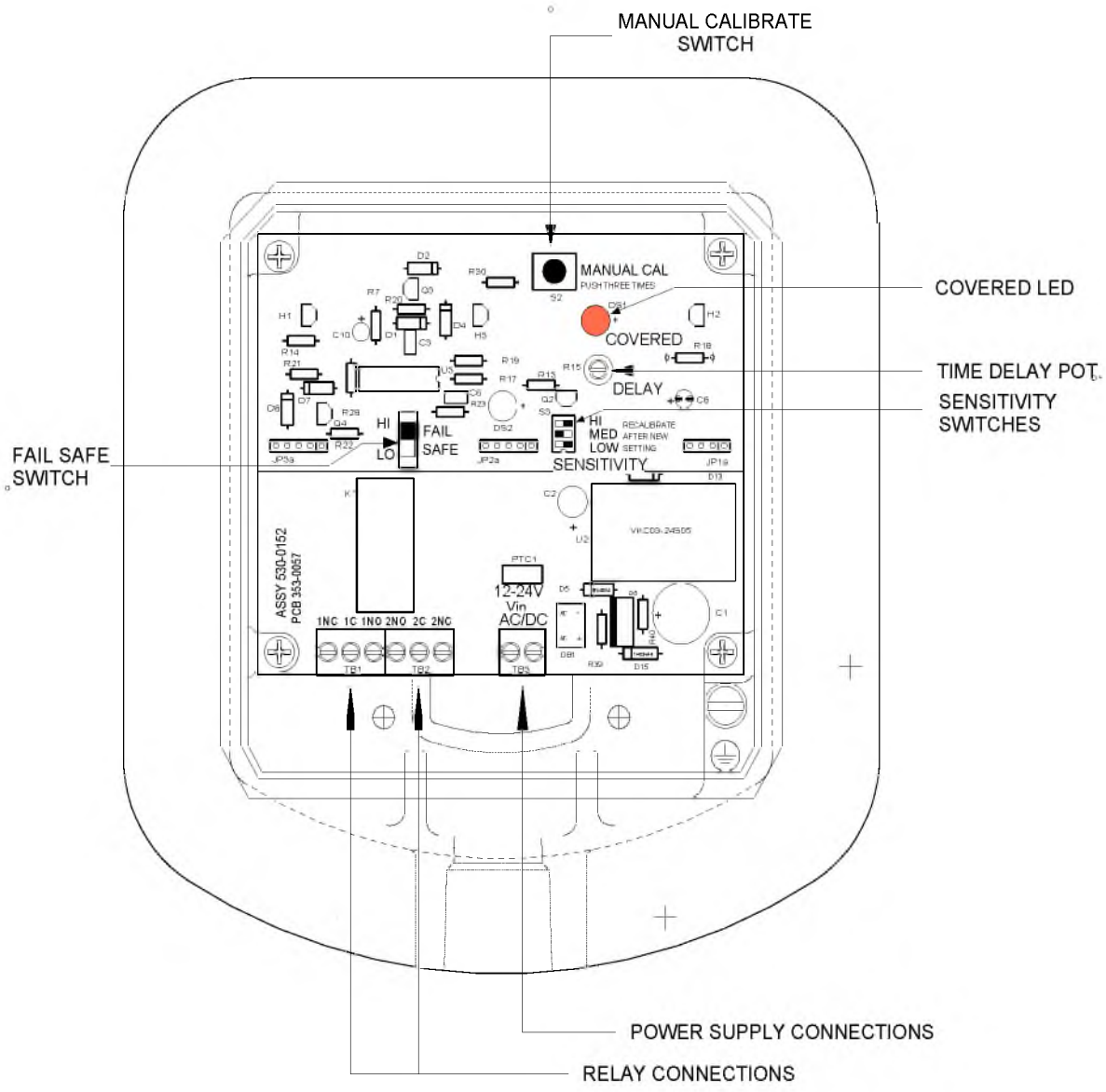
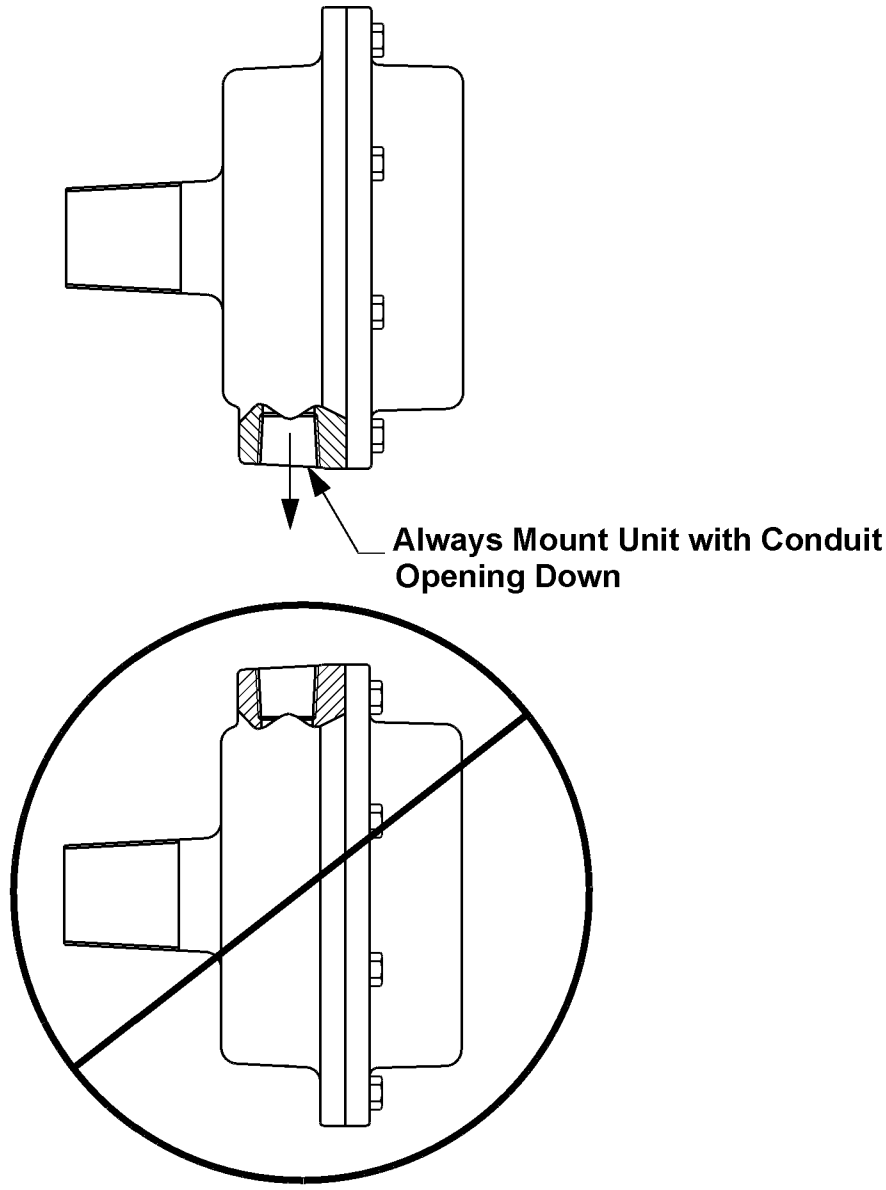

MANUAL CALIBRATE SWITCH
COVERED LED
TIME DELAY POT
SENSITIVITY SWITCHES
FAIL SAFE SWITCH
POWER SUPPLY CONNECTIONS
RELAY CONNECTIONS
MANUAL CAL
PUSH THREE TIMES
COVERED
DELAY
HI
MED
LOW
SENSITIVITY
RECALIBRATE AFTER NEW SETTING
FAIL SAFE
HI
LO
12-24V
Vin
AC/DC
1NC 1C 1NO 2NO 2C 2NC
ASSY 530-0152
PCB 353-0057

FIGURE 2.1

Mounting Instructions



CONDUIT SEAL

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure thru the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

CVR600

Level Control Instrument

Instruction Manual

925-0162 REV C

IMPORTANT:

for safety reasons and for proper function of these instruments it is strongly recommended to carefully read this instruction manual before installation!

Application

The CVR600 is a vibration type level control instrument that detects the minimum and maximum level in bins, silos and hoppers, filled with grained materials. Typical product applications are plastic granules, all kinds of pellets, corn etc.

IMPORTANT:

the instrument cannot be used for detecting materials which are sticky and tend to build a deposit on the probe! The CVR600 is not recommended for detecting powdered materials.

General Notes:

- Installation and maintenance must be performed by qualified technical personnel only.
- The CVR600 must be used only in the manner outlined in this instruction manual.
- The CVR600 vibrating level switches are sensitive sensors which need to be handled with care. Never expose these instruments to mechanical loads and temperatures higher than indicated in the technical data. Do not make any changes on these instruments.

Function

The signal from the electronic circuit of the CVR600 excites the rod of the instrument to vibrate on its resonance frequency of approx. 460 Hz. When material covers the rod of the probe, the vibration stops. This is sensed by the electronic circuitry which forces its relay to switch. When the blade gets uncovered, the vibration will restart and the relay will switch back.

Technical Data

Enclosure:	die cast aluminium (option: powder coated) protection IP 66 and IP 67 1 cable gland M16 (option: 2 cable glands) suitable for cable diameters 0.177 to 0.394 inches
Probe:	stainless steel 1.4301 / AISI 304 resonance frequency approx. 460 Hz
Mounting:	thread 1“ NPT
Power Supply:	wide range power supply 20...250V AC/DC
Power consumption:	3 VA
Relay:	1 SPDT max. switching voltage 250V-AC max. switching current 5A max. switching power 1250 VA cos φ = 1; 150 Watt for DC
Time Delay:	1 second from stop of vibration 2 to 5 seconds for start of vibration
Indication:	relay: red LED on PCB power: yellow LED on PCB

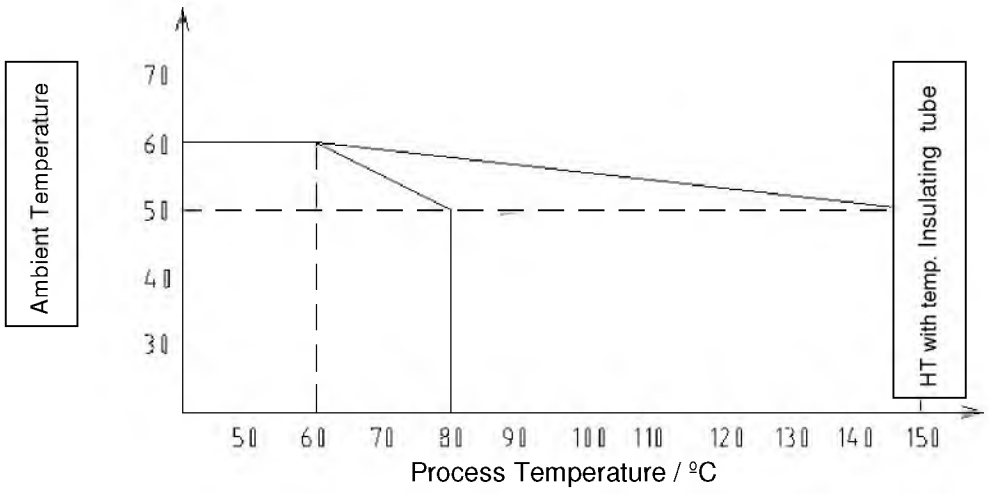
min. density of material to be monitored: 3.12 lbs / cu. ft. (50 g / liter)

max. vertical and horizontal load upon the end of the blade: 80 N

max. pressure inside bin: 10 bar

temperatures (see also following sketch):

- ambient temperature for electronics: -4°F to +140°F (-20°C to +60°C)
- process temperature for standard probe: -4°F to +176°F (-20°C to +80°C)
- process temperature for probe HT: -4°F to +302°F (-20°C to +150°C)
  (special model for high temperatures)



CE-Conformity

The vibration type level switch CVR600 meets the requirements of the following regulations:

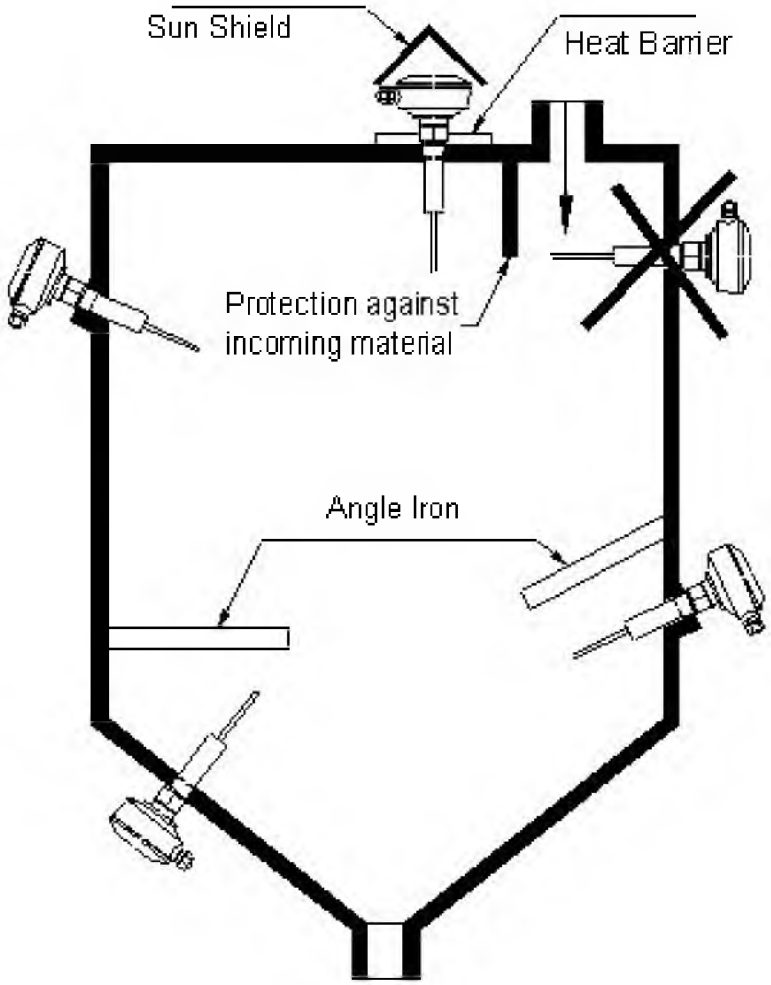
- EG-EMC-directive 89 / 336 / EWG
- EG-Low Voltage Directive 73 / 23 / EWG

Applied standards: EN 61326-1, EN 61326 / A1, EN 61010 T1

Mounting

The following has to be considered when mounting the CVR600:

- The switching point of the CVR600 depends on the density of the material: for heavy materials only a few millimeters of the vibrating rod have to be covered for damping the vibration. At light materials the material must cover the vibrating rod completely in order to damp its vibration.
- The CVR600 must not be mounted in or near the path of incoming material. The falling material could damage the probe.
- In order to keep the ambient temperature of the PCB within the allowed range of -4 to +140°F the housing should be protected from direct sunlight by installing a sun shield.
- A heat barrier has to be installed between the enclosure and the bin wall in cases the temperature of the material inside the bin exceeds 140°F (60°C). Instead it also is possible to use a temperature insulating tube which must be mounted between mounting socket and enclosure, (see chapter *Special Models*).



Side mounting or vertical mounting

- The CVR600 can be mounted at the container either from the side or vertical from top or bottom.
- For side mounting it is recommended to screw the CVR600 into the bin wall with the vibrating rod pointing slightly downwards (approx. 20°) so that material can more easily flow and does not rest on the vibrating rod.
- The CVR600 must not be mounted in or near the path of incoming material. If this cannot be avoided a protection shield, for example an angle steel with side length of approx. 2 inches, must be installed approx. 6 inches over the probe. A protection shield is also necessary for low level detection in order to protect the probe against falling material.
- The CVR600 gets installed by screwing the mounting socket of the instrument into the bin wall by means of a 36 mm open end wrench.
- A suitable sealing, (like Teflon tape), must be applied onto the thread.

IMPORTANT: Do not screw by turning the housing!

Orientation of the cable glands:

The cable glands must always point downwards to prevent moisture seeping inside the housing. If the housing is not in the correct position after the probe has been firmly screwed into the bin wall, proceed as follows:

- remove the cover of the housing, use a 4mm hexagon socket screw key, (Allen key)
- use a 10mm wrench to loosen the mounting nut in the center of the enclosure
- turn the housing into the correct position so that the cable glands are pointing downwards
- tighten the mounting nut, torque 3 to 4 Nm
- close the cover of the housing (torque 3Nm)

Cable ducts which are not used must get sealed!

Wiring

Safety Guidelines:

- Wiring of these instruments must only be performed by qualified technical personnel.
- Before opening the cover and start of wiring make sure that power supply on all wires has been switched off.
- According to DIN EN 61010-1 a main switch for this instrument has to be installed nearby the instrument with which power supply for this instrument **and** its relay output can be switched off. This switch must be marked as main switch of the instrument.
- For power supplies ≥ 50V protective earth has to be connected to the terminal on the enclosure.
- If power supply and relay signal do not have the same source the connecting wires of the power supply have to be separated from the connecting wires of the relay by means of wire fasteners in order to prevent the connecting wires of the power supply getting in touch with the relay terminals and vice versa, (which might be possible in case of an error, e.g. brake of a wire).

The cables for power supply and relay must be connected to the terminals according to the following sketch:
(also printed on the PCB!)

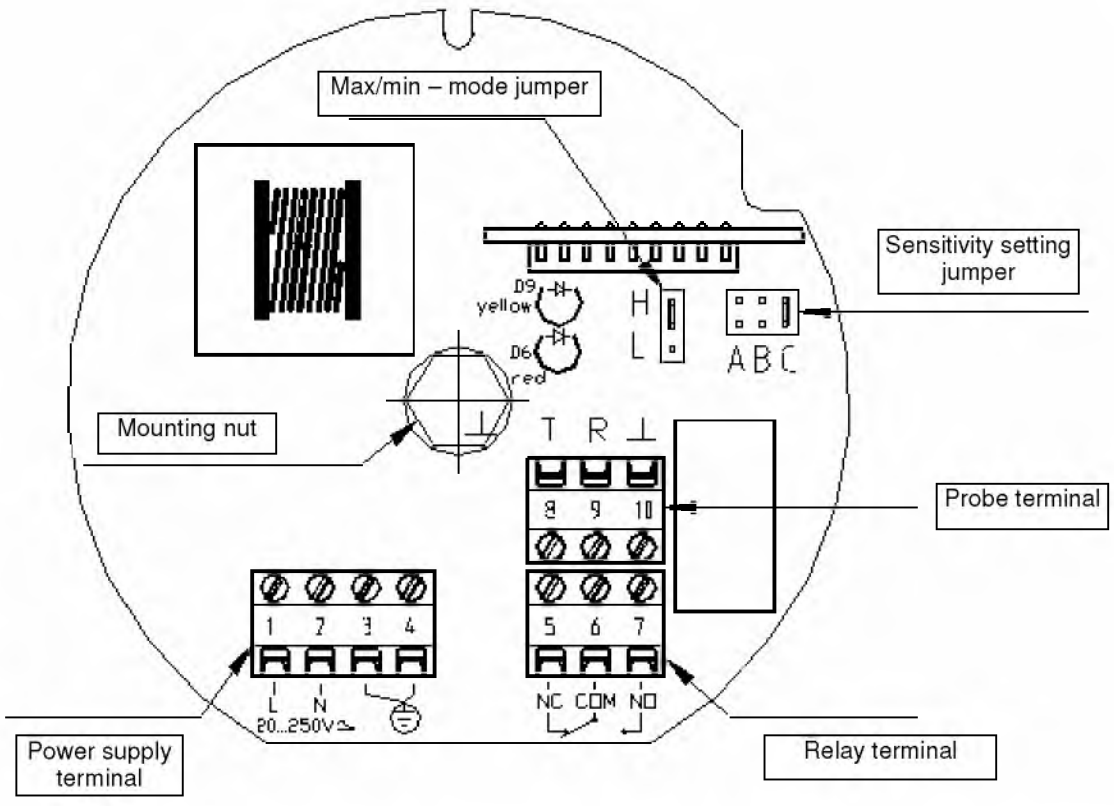
terminal for power supply:
1 = L
2 = N
} 20...250V AC/DC
3 = protective earth
4 = protective earth

terminal for relay:
5 = NC
6 = COM
7 = NO

The max. wire size for power supply and relay is 14 AWG.

The probe is connected to the PCB by the three leads of the probe:

terminal probe:
8 = T (red lead)
9 = R (yellow lead)
10 = ⊥ (black lead)

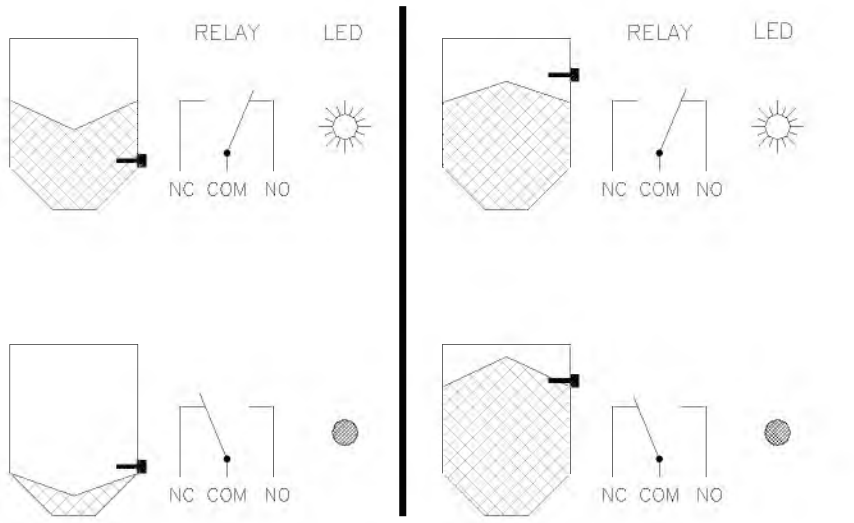


Adjustment

Failsafe high (H) / Failsafe low (L):
Switching Logic: see following sketch.

Failsafe high: jumper in position H: for high level alarm:
the relay is de-energized (position NC, red LED off), when the blade is covered by material or power has failed.

Failsafe low: jumper in position L: low level alarm:
the relay is de-energized (position NC, red LED off),
when the blade is free, (not covered by material), or power has failed.



Sensitivity:

selectable by jumper:

Pos. A: use this setting only for light material with densities down to 3 lbs/cu.ft. or 50g/l.
The sensitivity is high at this setting.

Pos. B: standard setting, sufficient for most materials.

Pos. C: for heavy materials with high densities which may form a deposit on the vibrating rod. As the sensitivity of the instrument is low at position C, light materials can not be detected at this setting!

Options

The following options are available:

- Enclosure powder coated
- Second cable gland

Special Models

- **Special model for high temperatures:**

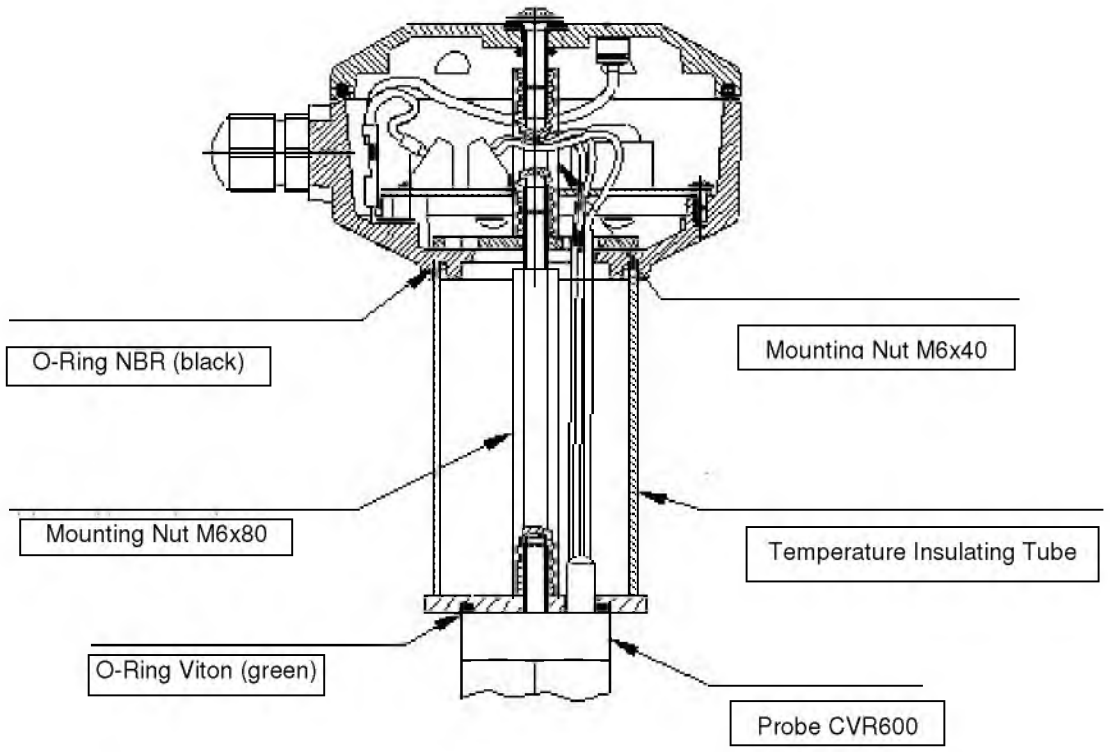
can be used for process temperatures up to 302°F (150°C).

Important: the instruments have got the same outlook as the standard instruments, therefore they are marked with labels *„Special Model HT“* and the serial numbers of probes and electronics do have the indices *„-HT“*.
Special model probes must only be used together with the according special model electronics and vice versa!

In order to ensure that the ambient temperature of the electronics, 140°F (60C°), will not be exceeded due to thermal conduction via the probe a temperature insulating tube has to be mounted between probe and enclosure or the electronics has to be installed at a remote place, (see following chapters).

- **Temperature Insulating Tube (see sketch below):**

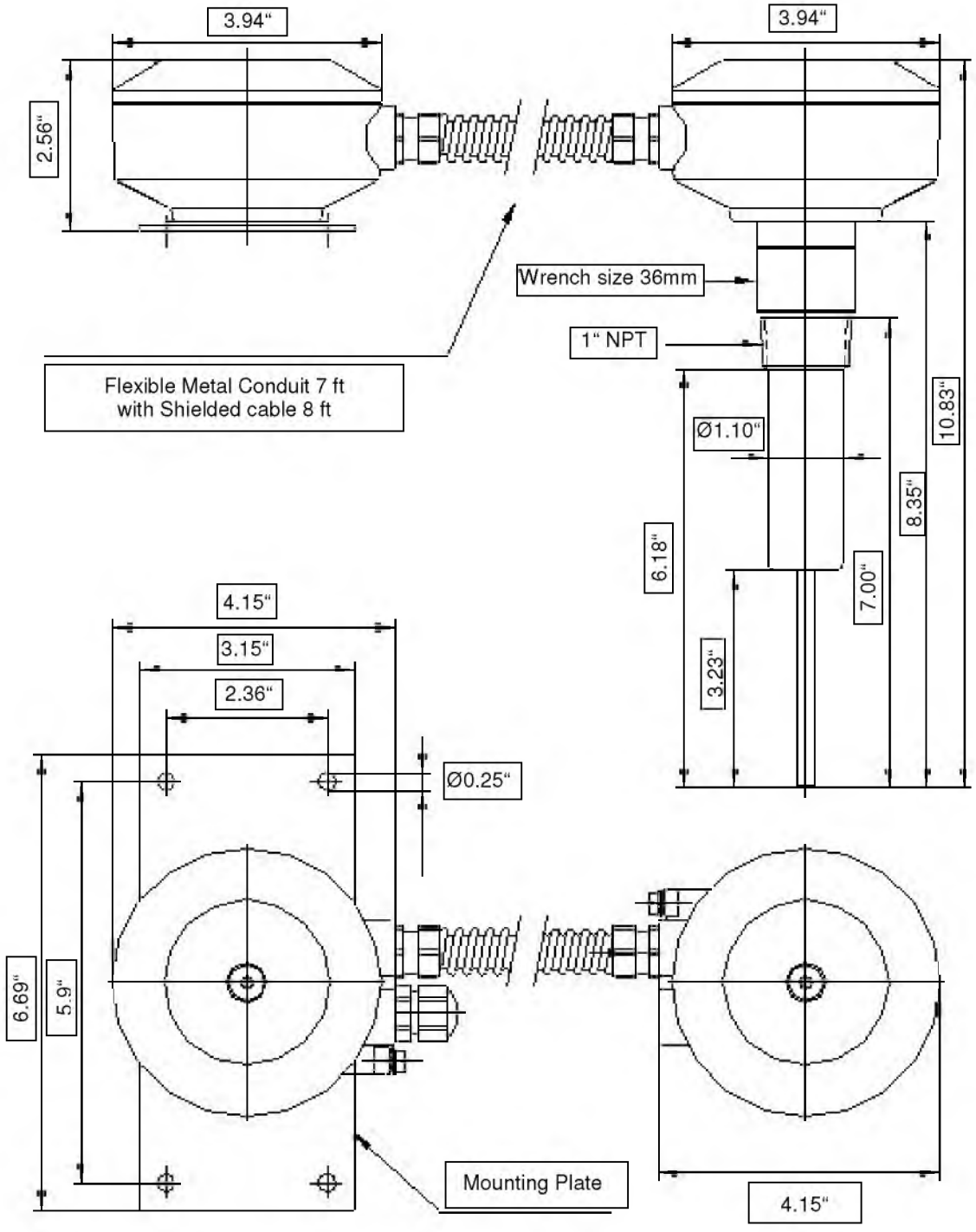
The temperature insulating tube consists of a stainless steel tube ∅50mm which is welded onto a stainless steel plate. The tube gets fixed onto the mounting socket of the probe by means of a 80mm long mounting nut M6. The enclosure gets fixed onto the tube by means of a washer ∅50x3 and the mounting nut M6x40. The green O-ring sealing, (special material Viton), must be located between mounting socket and tube and the black standard O-Ring must be located between tube and enclosure. Use torque 3 to 4 Nm for the screwing of the mounting nuts.



- Remote Electronics Installation (not available for dust-ex)

If the temperature outside the bin near the bin wall exceeds the maximum ambient temperature of the PCB, 140°F (60°C), it is necessary to install the PCB in a remote enclosure apart from the bin where the temperature is in the allowed range. Remote electronics installation is also necessary in case of heavy vibrations of the bin. In this case the remote enclosure has to be installed at a place apart from the vibrations.

PCB and probe get connected by a shielded cable via the terminal PCB which is located inside the enclosure fixed on top of the mounting socket of the probe. A metal hose which is screwed between the remote enclosure and the enclosure that contains the terminal PCB is protecting the cable. The remote enclosure can be installed by means of the mounting plate. Cable and metal hose can withstand temperatures up to 176°F (80°C). Protection of the remote electronics installation is IP65.



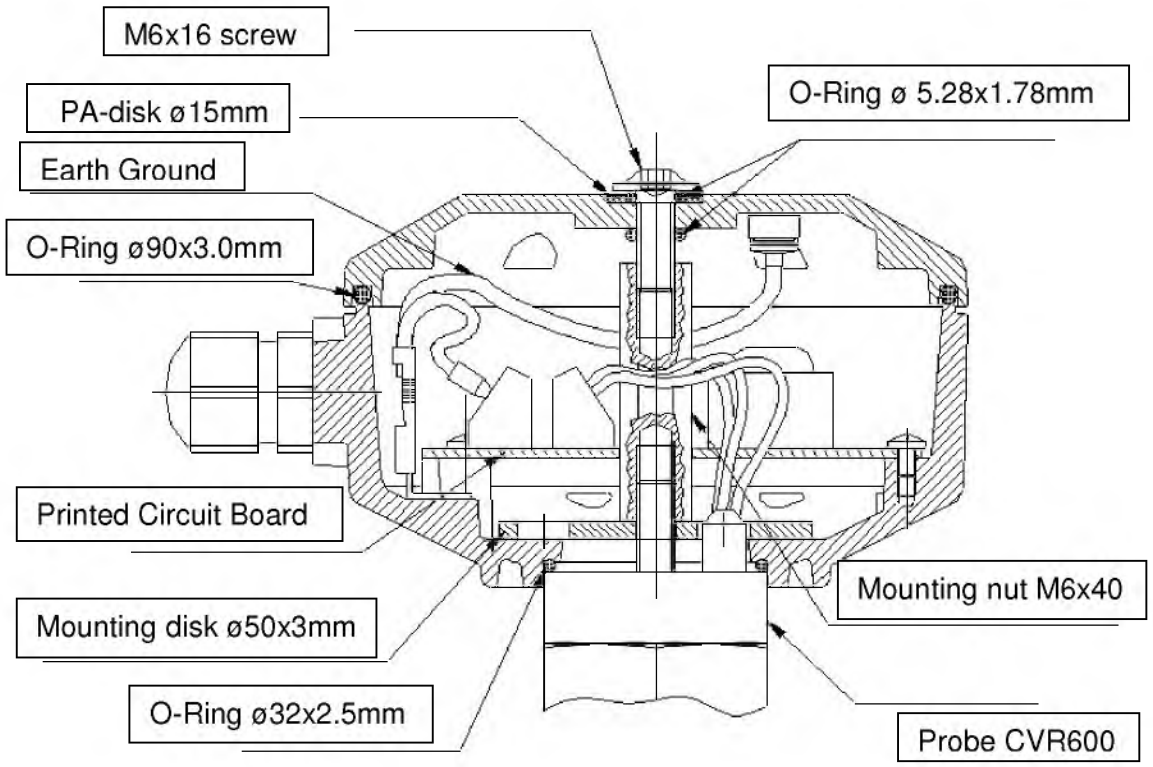
Spare Parts

The following spare parts are available:

- vibrating probe
- electronics
- enclosure

Contact the distributor who has supplied you with this instrument for spare parts or contact BinMaster directly.

Assembling of probe, enclosure and electronics must be done according the following sketch.



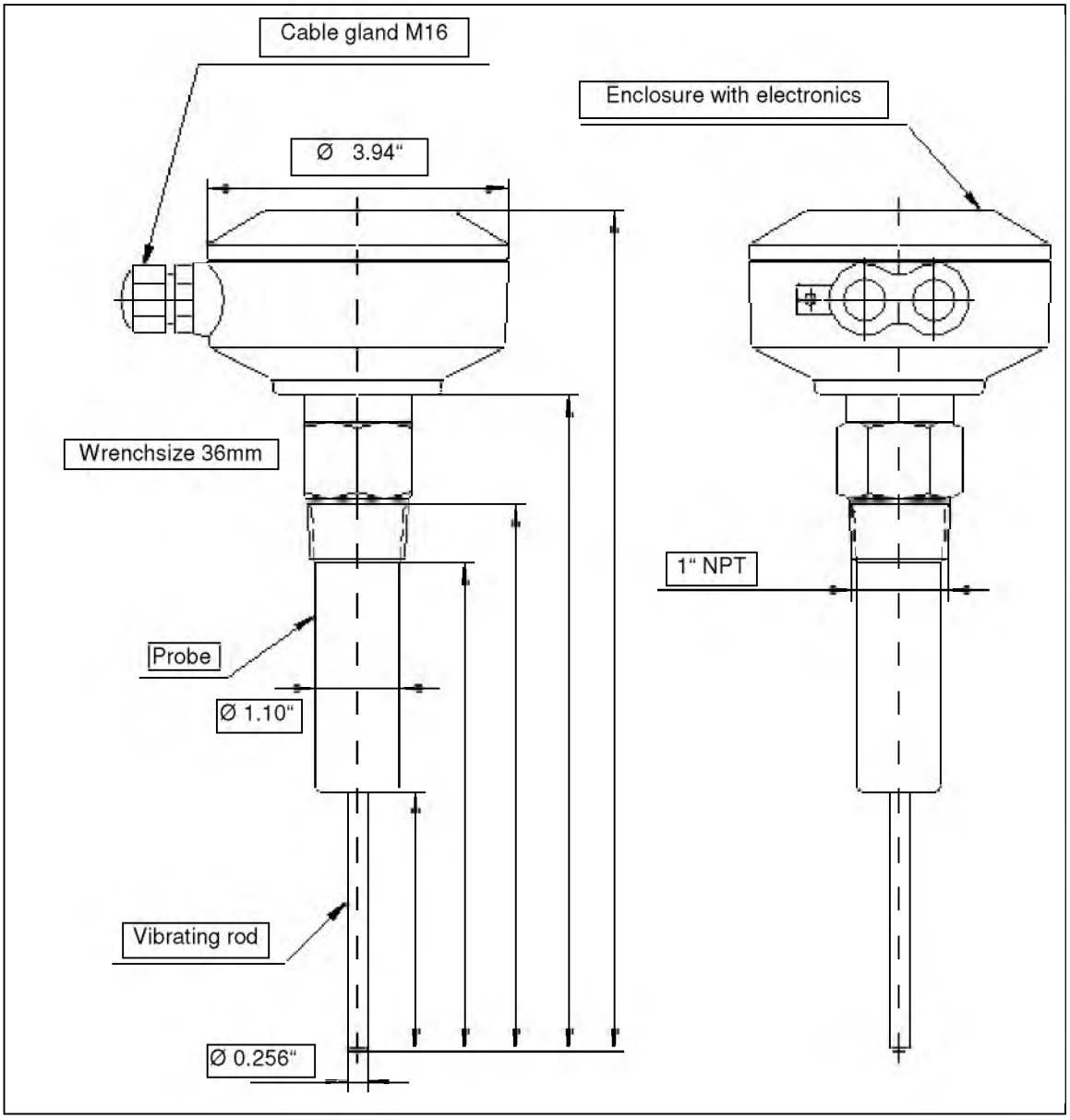
The following has to be considered:

- assembling must be done by qualified personnel only
- all O-ring seals must sit in its appropriate position according to the sketch aside
- apply torque 3 to 4Nm for the mounting nut M6x40
- apply torque 3Nm for the screw M6x16
- apply torque 3Nm for the cable gland
- care must be taken that special model probes will only be used together with the appropriate special model electronics

Maintenance

The CVR600 vibrating type level switches require no maintenance.
For applications with materials that are a little bit sticky we recommend to clean the vibrating blade of the instrument in certain periods of time. If the instruments are exposed to corrosive atmosphere they must be inspected in certain periods of time regarding corrosion of probe and enclosure in order to ensure the protection of the instruments.

Dimensions


Cable gland M16
Enclosure with electronics
Ø 3.94"
Wrenchsize 36mm
1" NPT
Probe
Ø 1.10"
Vibrating rod
Ø 0.256"

SHT 120 / 140
Vibrating Level Switch for hot bulk solids
Instruction Manual

925-0254 Rev A

Description

The ***SHT120*** is a piezoelectric driven vibration type level control instrument that detects the minimum and maximum level in bins, silos and hoppers, filled with grained or powdered materials, (bulk solids), which can have temperatures up to 250°C. The instrument can be used as overfill protection, for high or low level alarm. The signal from the electronic circuit of the ***SHT120*** excites the blade of the instrument to vibrate on its resonance frequency of 285 Hz. When material covers the blade of the probe, the vibration stops. This is sensed by the electronic circuit which forces its relay to switch. When the blade gets uncovered the vibration will restart and the relay will switch back.

Models

- *SHT120*: standard model
- *SHT140* model with threaded tube extension

Further advantages

- single blade construction eliminates the bridging problem typical for the "tuning fork" design
- high sensitivity up to 20 g/l
- strong stainless steel construction with reinforced vibrating blade
- highest quality, manufactured in Germany according to DIN EN ISO9001:2000

Specifications

Enclosure:	diecast aluminium, (option powder coated) protection IP 66 and IP 67 1 cable duct M20x1,5 , (option: second cable duct)
Power Supply:	wide range power supply 20 ... 250V AC/DC
Power consumption:	3VA
Relay:	1 potential-free change-over contact (SPDT, option: DPDT) max. switching voltage 250V-AC, 5A max. switching power 1250 VA, $\cos \varphi = 1$ 80 Watt for DC
Time Delay:	1 second from stop of vibration 2 to 5 seconds for start of vibration
Probe:	stainless steel 1.4301 / AISI 304 thread 11/2" DIN 2999 or 11/2" NPT resonance frequency 285 Hz max. vertical load upon the end of the blade: 1000 N max. horizontal load upon the end of the blade: 150 N
Indication:	relay: red LED on PCB power: yellow LED on PCB
min. density of material:	20 g / liter
max. pressure inside bin:	10 bar
ambient temperature electronic:	-20°C ... + 70°C
process temperature probe:	-20°C ... + 250°C

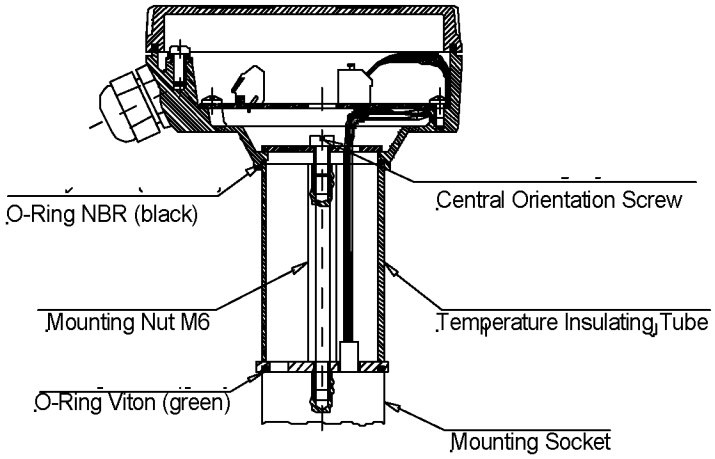
Temperature Insulating Tube

The temperature insulating tube must be mounted between probe and enclosure in order to prevent heat up of the electronics via the probe due to high process temperatures. The mounting is made according to the following sketch. The green O-ring sealing, (special material Viton), must be located between mounting socket and tube and the black standard O-Ring must be located between tube and enclosure. Use torque 3 Nm for the screwing of mounting nut and screw M6x12

The following drawing shows how probe, housing and PCB are assembled. In order to achieve protection IP66 and IP67 of the housing the following has to be considered:

- the O-ring-sealing between housing and socket must sit in its appropriate position
- the orientation screw must be tightened firmly, (torque 3 Nm)
- the sealing between housing and cover must sit in its appropriate position
- the cover must be fastened firmly onto the housing with the 4 screws
- the cable ducts must bescrewed firmly into the housing wall and tightened firmly.

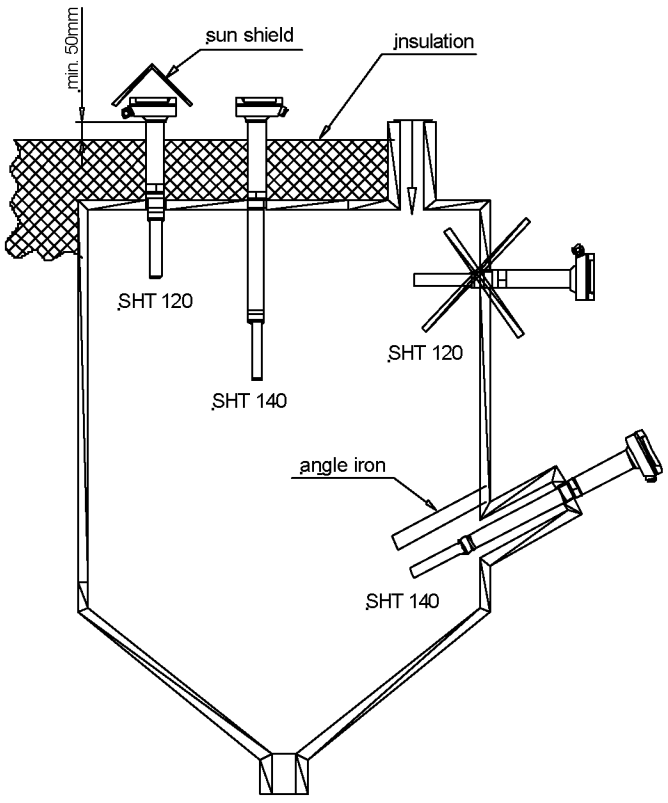
The PCB is fastened inside the housing by means of 3 screws.



Correct Mounting Position

When choosing the mounting position of the *SHT* at the bin the following has to be considered:

- The switching point of the *SHT* depends on the density of the material: for heavy materials only a few millimeters of the vibrating rod have to be covered for damping the vibration. At very light materials the material must cover the vibrating rod completely in order to damp its vibration.
- The *SHT* must not be mounted in or near the filling curtain ofthe bin. The filling stream could damage the probe and the turbulences of the pneumatic conveying system could lead to false signals.
- In order to keep the ambient temperature of the PCB within the allowed range of -20 to +70°C the housing should be protected from direct sunlight by installing a sun shield.
- The insulation of the bin should not completely cover the temperature insulating tube of the probe. The temperature insulating tube must be free in air for a length of at least 50mm in order to assure sufficient thermal emission.
- In cases where continuous vibrations of the bin are present, the PCB must be installed in a separate housing apart from the vibrations.
- For side mounting it is recommended to screw the *SHT* inside the bin wall with the rod pointing slightly downwards so that material can easily flow away.
- For low level detection a shield, for example an angle iron with side length approx. 50mm, must be installed approx. 150mm over the rod in order to protect the probe against falling material.
- Be sure to install the instrument in an area where no material can settle, (like in edges of the bin).
- The *SHT* must be mounted at a position where it cannot get damaged when the bin gets cleaned or inspected.



Mounting

The *SHT* gets installed by screwing the mounting socket of the instrument into the bin wall by means of a 50 mm open-end wrench.

Do not screw by turning the housing!

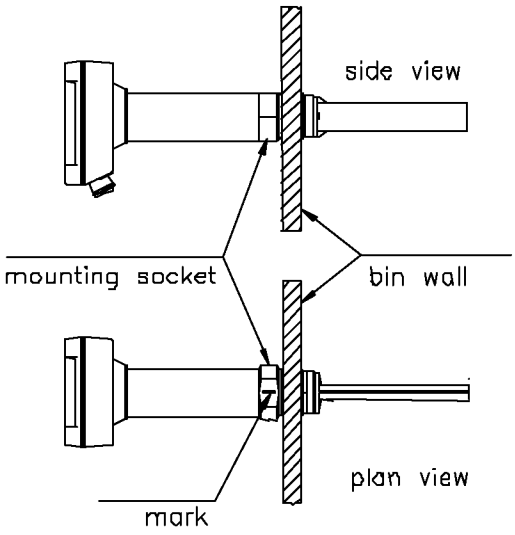
The cable ducts must always point downwards to prevent moisture seeping inside the housing.
If the housing is not in the correct position after the probe has been firmly screwed into the bin wall, proceed as follows:

- remove the cover of the housing
- loosen the screw in the center of the PCB
- turn the housing into the correct position (cable ducts pointing downwards)
- tighten the screw in the center of the PCB
- replace the cover of the housing.

The *SHT* is normally screwed into the bin wall at the level to be monitored in horizontal direction or with the blade pointing slightly downwards.

The probe must be kept out of the path of falling material to avoid damage. If this is not possible a shield, for example an angle iron, must be installed over the blade. Such a shield must always be installed when the instrument is used for low level indication.

When the probe is inserted horizontally into the bin, it must be turned until the blade is vertically oriented, so that material can flow freely over the blade and does not rest on it causing false alarm. Alignment of the blade is verified by the two slots in the mounting socket. These will be facing up and down when the orientation of the blade is correct.



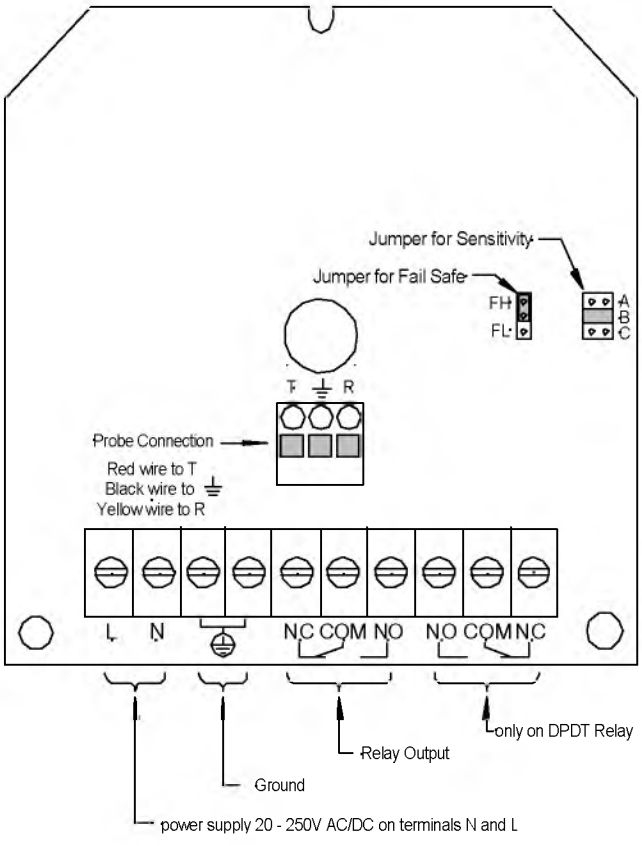
Connection

Wiring

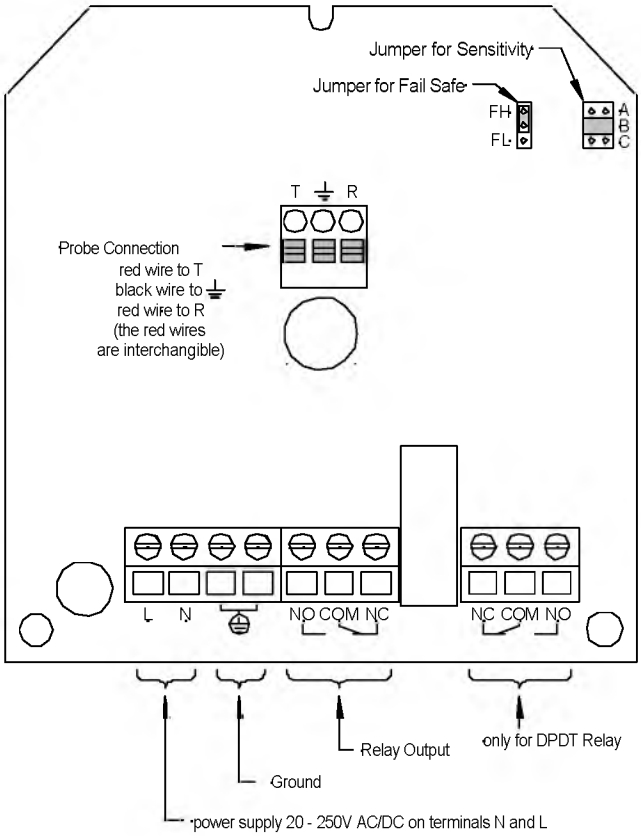
Before you start wiring make sure that power supply on all wires has been switched off !
According to DIN EN 61010-1 a switch for power supply has to be installed nearby the instrument and must be marked as main switch of the instrument!

The cables for power supply and relays must be connected to the terminals as indicated on the PCB.
The terminal on the PCB for power supply and control circuit allows a maximum lead diameter of 2.5 mm².

The probe is connected to the PCB by the three leads as shown in the following figure. The three wires of the probe get connected to the PCB via spring cage clamps: push the button of the clamp by means of a small screw driver and insert the wire end sleeve into the clamp, then release the button.



Through hole pcb



Surface mount pcb

Sensitivity

There are three sensitivity settings which can be selected by the sensitivity switch on the circuit board:

Pos. A:	high sensitivity: for very light materials like styrofoam
Pos. B:	standard setting
Pos. C:	low sensitivity: for heavy materials which may form a deposit on the vibrating blade, for example cement and chalk.

As the sensitivity of the instrument is low at position B and C, extremely light material such as expanded styrofoam can not be detected at these settings!

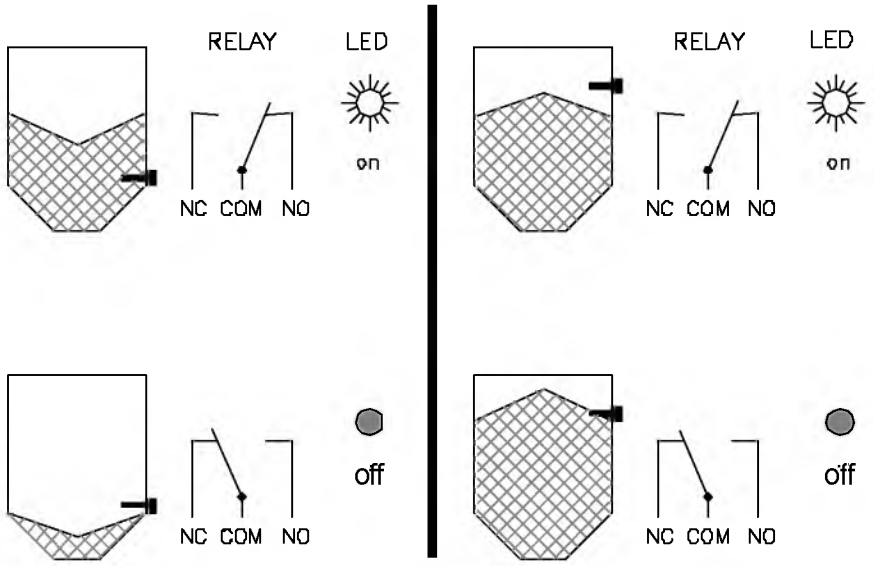
Failsafe high (FSH) / Failsafe low (FSL)

The *SHT* operates in either failsafe high (FH) or failsafe low (FL) mode.
The failsafe mode is selected by switch on the PCB.
The relay status is indicated by the red LED (D6) on the circuit board.

Through hole PCB

FSH: High Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is covered by material.

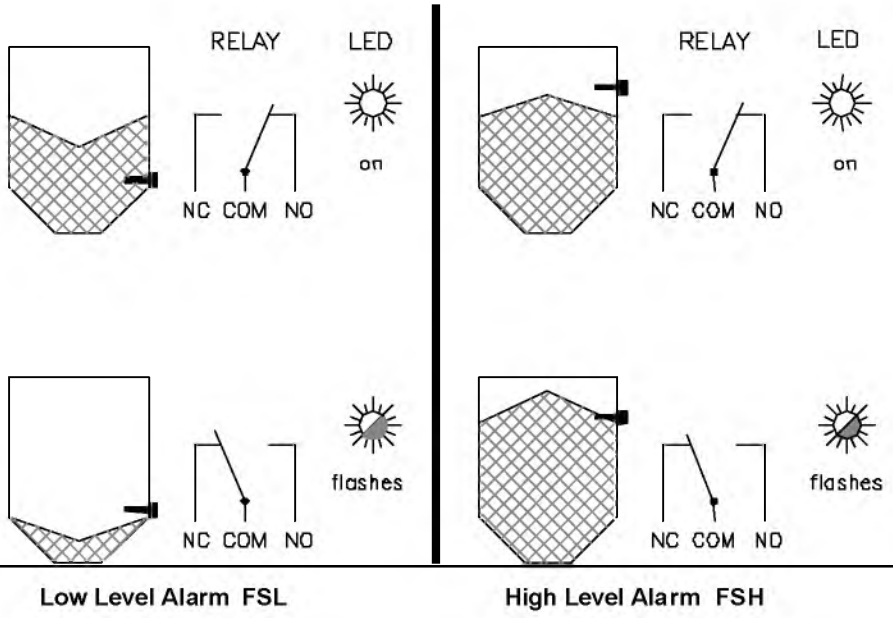
FSL: Low Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is not covered by material.



Surface Mount PCB

FSH: High Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is covered by material.

FSL: Low Level Alarm: The relay is de-energized and the Red LED flashing, when the blade is not covered by material.



Function Control

After wiring and adjustment the function of the *SHT* can be tested by switching on the power and checking the relay status. There is a difference depending on whether the printed circuit board is a through hole design or a surface mount design.

On the through hole design , there are 2 LEDs, a Yellow LED and a Red LED. The Yellow LED must go on as soon as power is switched on. The Red LED must be on or off depending on the FH/FL jumper setting according to the figure.

On the surface mount design , there is just one Red LED. The Red LED must be on solid or flashing depending on the FH/FL jumper setting according to the figure. If the LED is off then the unit is not powered or there is a problem on the circuit board.

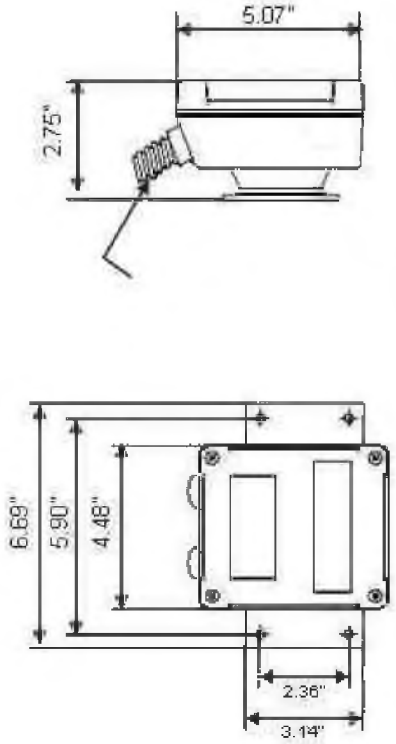
Please note the following exception: if the power supply will be switched on with failsafe mode at setting FL the relay, in contrary to the figure, will be energized for approx. 2 to 5 seconds although the probe is not covered with material. The relay will switch back to normal status after the probe fully vibrates. This is a normal behaviour which occurs only when power supply is switched on at FL-mode.

A final test has to be made by filling and emptying the bin.

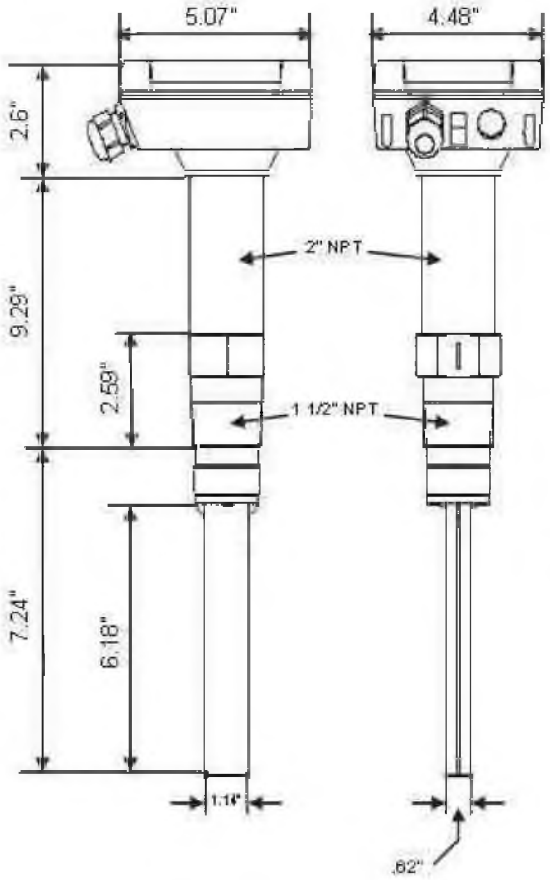
After the positive function tests the cover must be fastened firmly onto the housing with the 4 screws and the cable gland must be tightened to ensure the protection of IP66 and IP67 of the instrument.

Dimensions

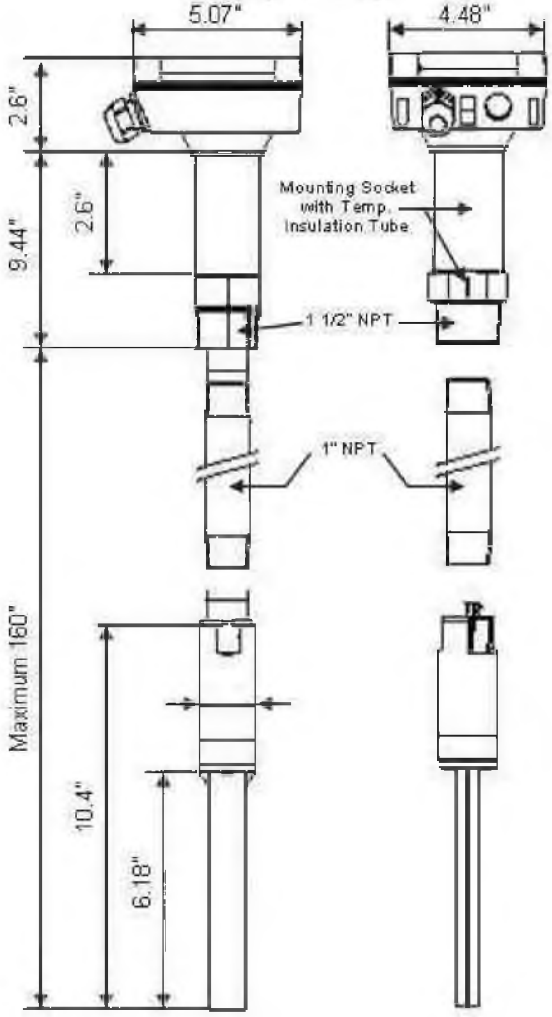
Remote Electronics



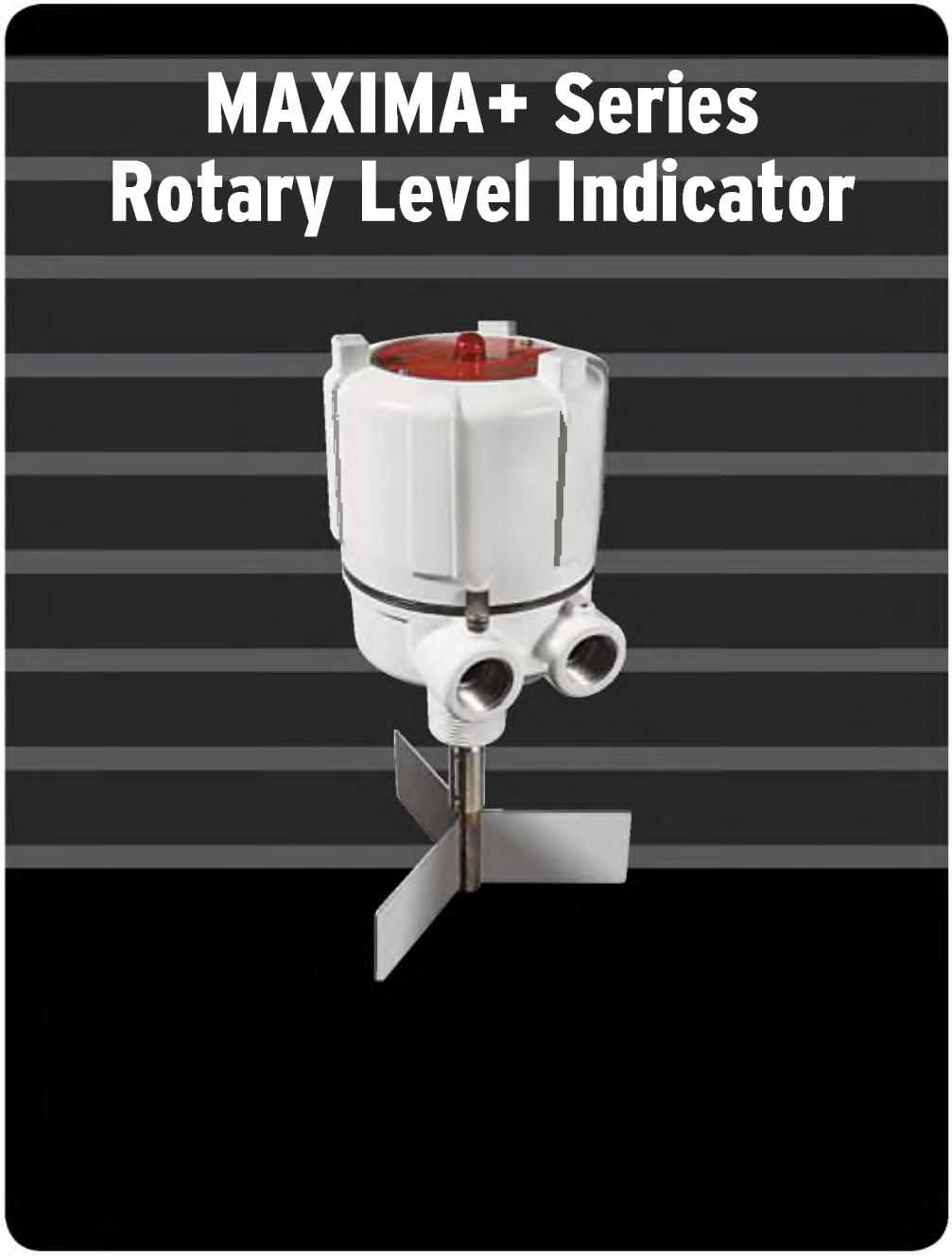
SHT-120



SHT-140



MAXIMA+ Series
Rotary Level Indicator



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SPECIFICATIONS

MAXIMA+ GENERAL SPECIFICATIONS

Supply:	**AC MODEL**	24/115/230 VAC 50/60 Hz (selectable)
	DC MODELS	12 VDC Model or 24 VDC Model
Supply Tolerance:		-15% +10%
Load:		AC Model = 8 VA; DC Models = 4 VA
External Overcurrent Protection:		
	AC MODEL	24 VAC = 750 mA; 115 VAC = 200 mA; 230 VAC = 100 mA
	DC MODELS	Internally protected, no external fusing required
Ambient Temperature:		
	(Electronics)	-40°F to +158°F (-40°C to +70°C)
Enclosure:		Type 4X, 5, 9, & 12 (Hazardous locations, Class II, Groups E, F & G)
DPDT Relay Output:		10 Amps 250 VAC
Fail-Safe:		Switch selectable "High" or "Low" level modes
Status Indicator Relay:		SPDT = 10 A 250 VAC (optional) DC Solid State Relay = 1 A 42 VDC (optional) AC Solid State Relay = 1 A 250 VAC
Time Delay:		Selectable 5 seconds (default); programmable to 25 seconds
Mounting:		1-1/4" NPT
Conduit Entry:		3/4" NPT

SAFETY

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all national and local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Properly ground the enclosure to an adequate earth ground.

Observe all terminal and relay contact ratings as called out on the nameplate and in the installation manual.

Ensure that the enclosure cover is in place and secured tightly during normal operation.

If this product is used in a manner not specified by the manufacturer, the safety protection could be compromised.

Safety Terms and Symbols

⚠ **WARNING:** Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

⚠ **CAUTION:** Caution statements identify conditions or practices that could result in damage to this product or other property.

Safety Precaution

⚠ **CAUTION:** Before removing the enclosure cover, open all circuits entering the enclosure. Be aware that there may be more than one live circuit.

INTRODUCTION

1.0 INTRODUCTION

The BinMaster MAXIMA+ is a rotating paddle style level sensor that provides reliable point level detection for bulk solids, including powder, pellet, and granular materials. The unit's status is continually monitored, and its fail-safe circuitry will fail to a "safe" condition in the event of a unit failure or power failure. A visual LED continually indicates the sensor's status, giving a quick visual monitoring of paddle rotation, covered condition or fault condition. A status relay is also provided for monitoring the status of the sensor.

The MAXIMA+ motor rotates the drive shaft and paddle at 1 RPM (2 RPM on 24 VDC Model). When the vessel material fills to the level of the indicator paddle, the material causes the paddle to stop rotating indicating a covered condition. When the material falls away, the paddle starts rotating again to indicate an uncovered condition.

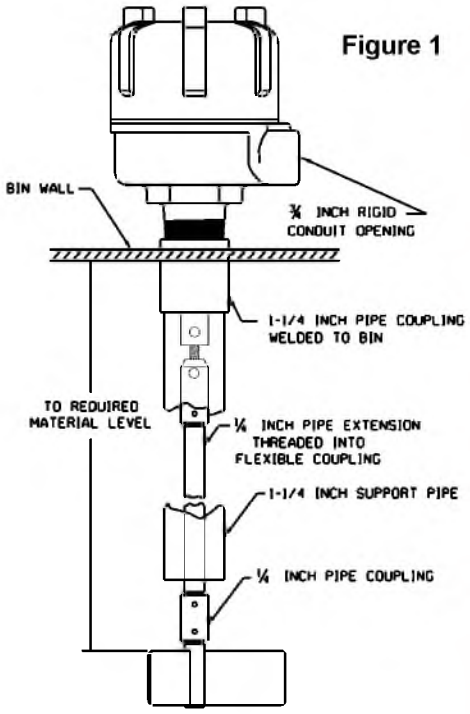
2.0 INSTALLATION

2.1 Location and Mounting

TOP MOUNT

1. Locate and cut hole in top of bin to fit outside diameter of 1-1/4" pipe coupling (1.950").
2. Position coupling halfway into bin and weld.
3. Turn unit so conduit opening is in desired location.
4. Add 1/4" extension pipe to desired length with standard 1/4" coupling on bottom end.
5. Cut 1-1 /4" support pipe approximately 4" shorter than overall length of 1/4" pipe shaft when used with flexible coupling.
6. Insert 1-1/4" pipe into coupling and tighten.
7. Insert paddle into 1/4" coupling and drill holes for lock pins.

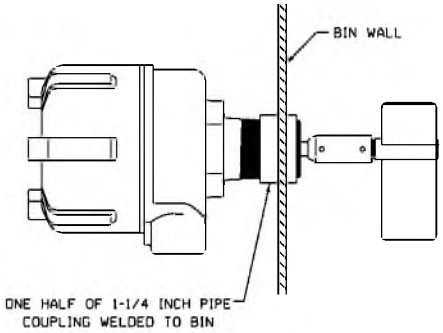
Figure 1



SIDE MOUNT

1. Locate and cut hole in side of bin to fit outside diameter of 1-1/4" pipe coupling.
2. Weld on half of standard 1-1/4" pipe coupling to bin wall flush with inside of bin.
3. Insert hub into coupling and turn so the conduit openings are pointed down.
4. Screw paddle into place and replace lock pin.
5. Shaft and paddle should be shielded in low level mounting when subjected to material flow.
6. For side mount, a solid coupler is recommended.

Figure 2



MOUNTING PLATES

Mounting plates are necessary when a completely assembled unit is to be mounted on the bin wall from the outside. A 5-1/2" hole is cut in the bin. Six bolt holes are drilled around the hole to match the mounting plate. The plate, with the unit attached, is then bolted in place. All mounting plates are available in carbon and stainless steel.

Full Coupling

For use with all rotary level controls. This model is used for top of bin installations where shaft extensions and shaft guards are required.

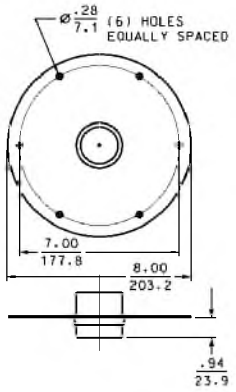


Figure 4

Half Coupling

For use with all rotary level controls. This model is used primarily for side of bin installations.

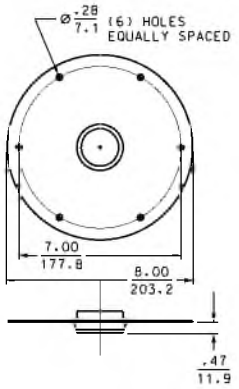


Figure 5

2.2 Input Power and Field Wiring

⚠ The MAXIMA+ is available in an AC Model and two DC Models. See the voltage rating on the nameplate for the appropriate supply voltage. The AC Model can be powered from either a 24 VAC, 115 VAC, or 230 VAC supply (see diagram below). ***The voltage selector switch must be put in the correct voltage position for the power supplied to the LINE input terminals N and L.*** Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation. For power input, use wire that is sized and rated for the maximum voltage and current as per equipment ratings and has a temperature rating of at least 70°C. For relay outputs, use wire that is sized and rated for the maximum voltage and current as per application, up to 250 VAC 10A, and has a temperature rating of at least 70°C. Installation shall be done by qualified personnel.

AC Models

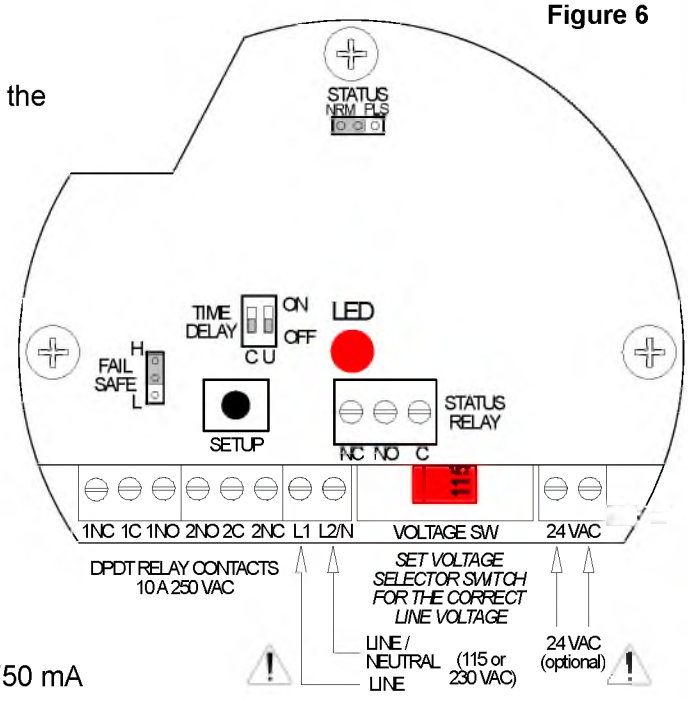
⚠ **115 or 230 VAC Input Power**

1. Confirm that the voltage selector switch is in the correct position for the voltage applied.
2. The LINE INPUT is connected to terminals L1 and L2/N when the input voltage is either 115 VAC or 230 VAC.
3. If your circuit has a neutral conductor, connect it to the L2/N terminal. Connect the hot conductor to the L1 terminal.
4. External overcurrent protection: 115 VAC = 200 mA 230 VAC = 100 mA

⚠ **24 VAC Input Power**

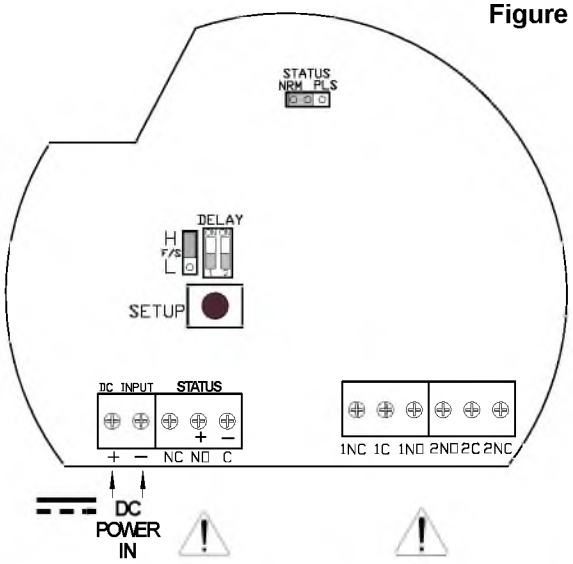
1. The 24 VAC terminals are used when the input voltage is 24 VAC.
2. When powered from a 24 VAC system, ***neither conductor can be grounded.***
3. External overcurrent protection 24 VAC = 750 mA

Figure 6



DC MAXIMA+ Wiring

Figure 7



⚠ DC MAXIMA+ units are available in either a 24 VDC or 12 VDC model.

1. Confirm that the DC MAXIMA+ unit is rated for the DC voltage that is used.
2. Refer the drawing to the right for correct terminal location.
3. The positive (+) conductor of the power input is connected to the (+) terminal of the DC INPUT.
4. The negative (-) conductor of the input power is connected to the (-) terminal of the DC INPUT.

2.3 Grounding

⚠ An equipment grounding connection (earth ground) must be supplied to the unit for safety. Connect the ground conductor to the green equipment grounding screw identified in the enclosure.

3.0 RELAYS

⚠ The MAXIMA+ has two different relays, a DPDT relay and a STATUS relay. The DPDT relay is used for covered and uncovered indication. The Status relay is used for monitoring the status of the MAXIMA+ unit. The DPDT relay outputs may be connected to different phases, only for voltages up to 125 VAC. For voltages above 125 VAC, the relays shall be connected to the same phase circuit only.

3.1 DPDT Relay

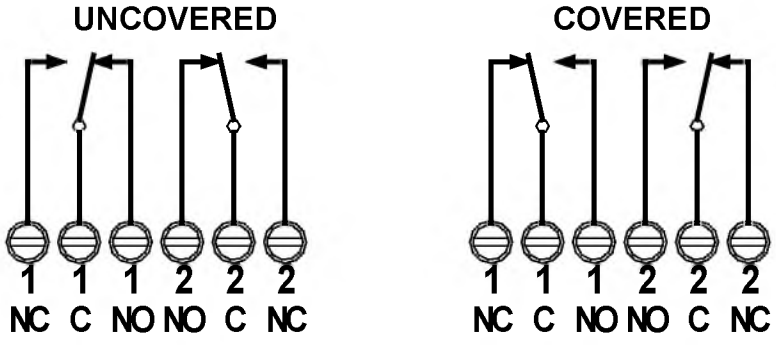
The DPDT relay utilizes a Fail-Safe selection jumper F/S. There are two positions for this jumper High (H) and Low (L). A Fail-Safe condition means that the DPDT relay contact positions are set up so that in the event of a fault condition or a power failure the relay will be de-energized and the contacts will indicate a condition that is deemed safe for the application.

3.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the paddle is rotating (uncovered) and will de-energize when the paddle is covered. In this mode, a fault condition or a power failure will cause the relay contacts to indicate that the paddle is covered, whether it is or not.

Figure 8

FAIL-SAFE "HIGH" RELAY CONTACT POSITION

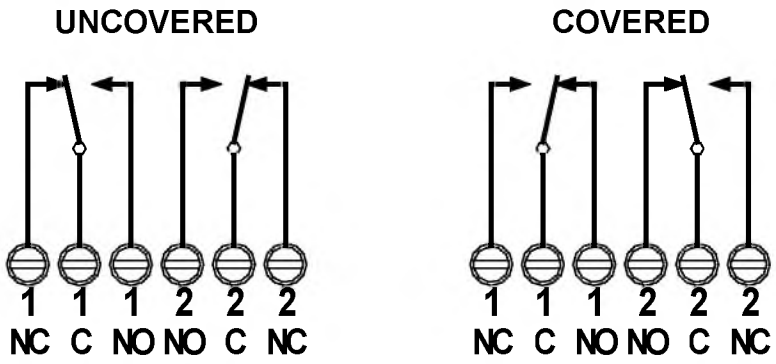


3.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the paddle is rotating (uncovered) and will energize when the paddle is covered. In this mode, a fault condition or a power failure will cause the relay contacts to indicate that the paddle is uncovered whether it is or not.

Figure 9

FAIL-SAFE "LOW" RELAY CONTACT POSITION

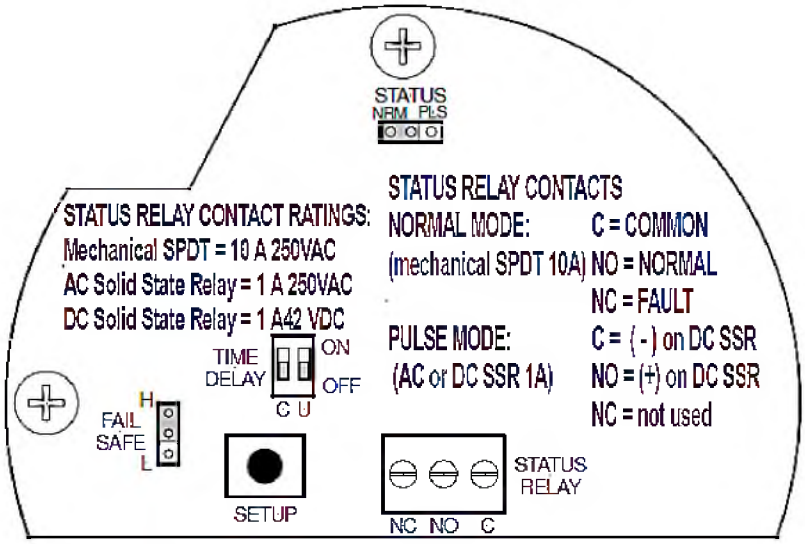


3.4 Status Relay

The Status Relay indicates the status of the MAXIMA+. There are two modes of operation for the Status Relay, Normal (NRM) and Pulse (PLS). The mode for the Status Relay is selected by the STATUS jumper at the top of the circuit board (see Figure 10).

In the NORMAL (NRM) position, the Status Relay is energized when the MAXIMA+ is operating correctly. In this mode the shaft rotation is monitored. If the shaft is not rotating then the "covered" switch is monitored to see if there is a covered condition. If the shaft is not rotating and the "covered switch" is not indicating covers, then the Maxima will go into a Fault condition. A Fault condition is indicated by both the Status Relay and the DPDT de-energizing and the visual LED going off.

Figure 10



In NRM mode, the Status Relay will have a connection between the C and the NO terminal. In a Fault condition there will be a connection between the C and NC terminals when using the standard SPDT relay. The solid state relays are SPST, they do not use the NC terminal. In Normal mode with either of the solid state relay options, there will be a connection between the C and NO terminal when the MAXIMA+ is operating normal. During a Fault condition the there will be no connection between the C and NO terminal.

In the Pulse (PLS) mode it is recommended to have one of the solid state relay options. In Pulse Mode (PLS) the Status Relay will be energized during a covered condition and there will be a connection between the C and NO terminals. When the paddle is rotating (uncovered) the Status Relay will be pulsing ON and OFF like the visual LED. During a Fault condition the Status Relay will de-energize.

4.0 TIME DELAY

The MAXIMA+ has selectable time delay for the DPDT relay contacts. This time delay can be selected for switching from an uncovered to a covered condition or it can be selected for switching between a covered to an uncovered condition or both. The time delay is selected by the two time delay DIP switches. Switch 1 is for selecting a time delay for going from an uncovered to a covered condition. Switch 2 is for selecting a time delay for going from a covered to an uncovered condition. When the switch is OFF there is no time delay. When the switch is ON there will be a time delay for that condition.

By default the time delay is set to 5 seconds for both switches. This time delay can be changed by using the SETUP push button switch on the circuit board. (Refer to Figure 10). The Delay Time can be set for each switch independently or for both together if the same delay time is desired for both ”delay on covered” and “delay on uncovered”. The maximum time delay that can be programmed is 25 seconds. Follow the procedure in 4.1 to change the delay time.

4.1 Changing Delay Time

Step 1. Select the switch for the delay time that you want to change by placing it in the ON position. Switch 1 is for “Delay on Covered”. Switch 2 is for “Delay on Uncovered”. The new delay time will be set for switch or switches in the ON position. At least one of the delay switches must be ON in order to enter the programming mode.

Step 2. Press and hold the SETUP switch (refer to Figure 10) for three seconds to initiate the programming mode. The LED will flash for these three seconds at a fast rate to indicate entry of the program mode. Releasing the SETUP switch during this initial three second period will abort the program mode and leave the delay times unchanged.

Step 3. After the three seconds has passed, continue holding the SETUP switch for the desired amount of delay time in seconds. The LED stops flashing and will blink every second to give you indication of the delay time so far. Each one second flash is one second of delay time.

Step 4. After the desired amount of delay has passed, let go of the SETUP switch and the delay time will be set for the delay switches that are in the ON position. You may enter up to 25 seconds. Holding the SETUP switch longer than this will have no effect and limit the delay to 25 seconds.

5.0 EXTERNAL LED

MAXIMA+ models include an external view LED. This LED provides an externally visible status indication for the MAXIMA+. When this LED is flashing, it indicates a normal Uncovered condition. When this LED is ON steady, it indicates a Covered condition. When this LED is OFF, it indicates a power failure or fault condition.

6.0 WARRANTY AND CUSTOMER SERVICE

6.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.) This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied.

6.2 Customer Service

BinMaster offers a toll-free Customer Service phone number **1-800-278-4241.** You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00 AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via fax at **(402) 434-9133.** BinMaster can also be emailed at support@binmaster.com.

7.0 DISPOSAL

This product consists of materials that can be recycled by specialized recycling companies. It uses recyclable materials and the electronics are designed to be easily separated. Consult local authorities for proper disposal locations.

Declaration of Conformity

BinMaster declares that all models of the MAXIMA+ level control devices as listed below comply with the following directives and harmonized standards. This product if installed, operated and maintained as described in this manual will provide a safe and reliable point level control device for bulk solid materials.

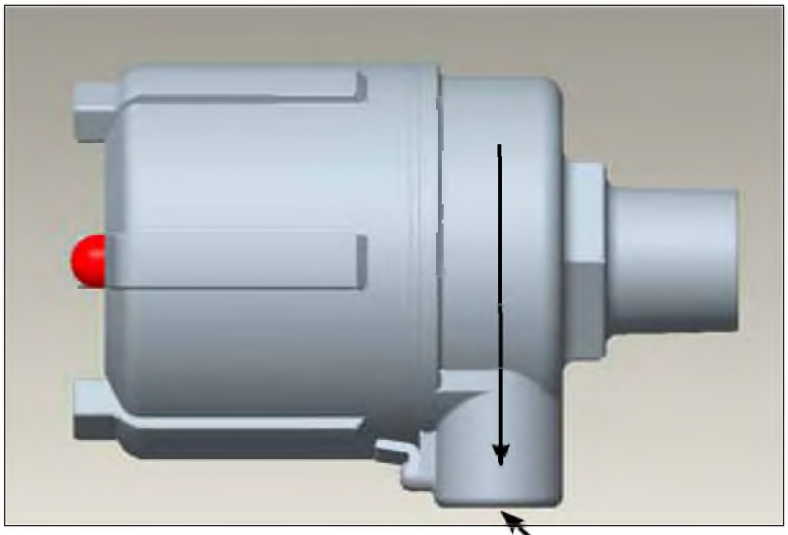
Low Voltage Directive 73/23/EEC
Standard IEC 61010-1:2001

Product: Rotary point level control device.
Models: MAXIMA+ AC Model 24 VAC / 115 VAC / 230 VAC; DC Models 12 VDC and 24 VDC

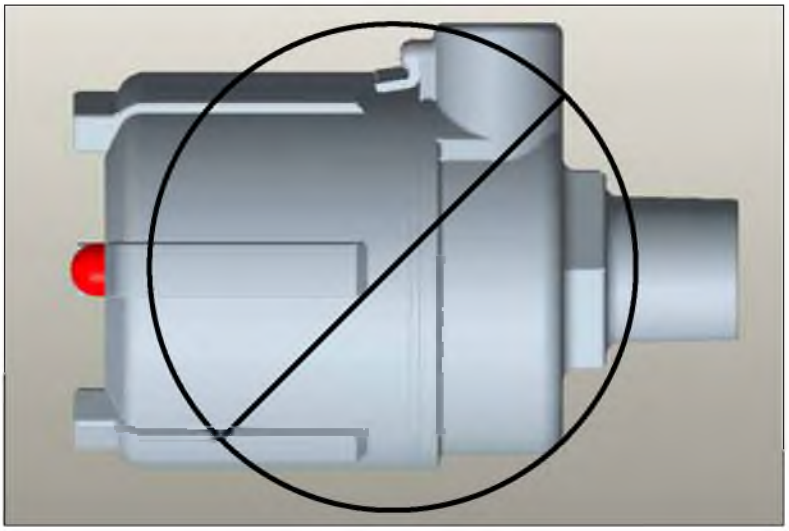
All test reports and documentation are held and can be obtained from BinMaster.

Manufacturing Location: Lincoln, Nebraska, USA

Mounting Instructions



Always mount unit with conduit opening down



Conduit Seal

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure through the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

Price $5.00

BINMASTER®

PROCAP I Series
CAPACITANCE PROBE

OPERATING INSTRUCTIONS
PLEASE READ CAREFULLY

BINMASTER®

9250290 Rev A

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PROCAP I
GENERAL SPECIFICATIONS

Supply:		24 TO 240 VAC or VDC
Load:		4VA
Ambient Temperature: (Electronics)		-20° F to +145° F (-28° C to +62° C)
Sensitivity:		1 picofarad
Enclosure:	PROCAP I	Type 4X, 5, 9, & 12 (HAZ LOC CL II E, F, & G)
	PROCAP I X	Type 4X, 5, 7, 9, & 12 (HAZ LOC CL I C&D; CL II E,F, & G)
Fuse F1:		0.4A 250V Time Delay 5 X 20MM BinMaster P/N 328-0064
Relay Contact Rating:		DPDT contacts; 10 Amps 250 VAC maximum
Fail-Safe:		Switch selectable "High" or "Low" level modes.
Calibration:		Set when probe is uncovered: COARSE adjust; single turn potentiometer FINE adjust; single turn potentiometer
Status Indicator:		Internal LED indicates material in contact with probe. PROCAP I has an external LED also
Time Delay:		Independently adjustable up to 30 seconds
Probe Shield:		Automatically compensates for material buildup on the probe
Mounting:		1 1/4" or 3/4" NPT - When used in liquid applications the stainless steel threads must be used to insure a proper seal.
Conduit Entries:		3/4" NPT

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all National and Local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Properly ground the enclosure to an adequate earth ground.

Observe all terminal and relay contact ratings as called out on the nameplate and in the installation manual.

Insure that the enclosure cover is in place and secured tightly during normal operation.

If this product is used in a manner not specified by the manufacturer the safety protection could be compromised.

Safety Terms and Symbols

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

1.0 INTRODUCTION

The Bin-Master PROCAP I is a point level control used to detect the presence or absence of solids or liquids. The PROCAP I operates on the capacitance principle and incorporates a "Quick Set" feature to simplify calibration. The PROCAP I includes switch selectable Fail-Safe output contacts and "Probe Shield" technology for ignoring material build up.

Upon installation the PROCAP I is set up with the probe uncovered. The "Quick Set" feature allows simple setup and calibration of the unit to achieve low, medium, or high sensitivity settings. The PRO CAP I has an adjustable time delay for monitoring covered or uncovered conditions.

2.0 APPLICATIONS

For applications in pressurized vessels up to 500 PSI, the PROCAP I should be mounted with the 3/4" or 1 1/4" stainless steel threads. **When the PROCAP I is used in liquid applications the stainless steel threads must be used to insure a proper seal.**

Process temperatures for the various probes are:

1. Delrin Sleeved Stainless Steel:	250 Deg. F
2. Teflon Sleeved Stainless Steel:	500 Deg. F
3. Flush Mount (Polyethylene):	180 Deg. F
4. Flush Mount (Teflon):	450 Deg. F
5. Bare Stainless Steel:	250 Deg. F
6. Flexible Extension:	250 Deg. F

The Delrin or Teflon sleeved stainless steel probe should be used when mounting the PROCAP I In a highly corrosive atmosphere. Confirm that the sleeve material is rated for use in the corrosive nature of the application. Bare metal Stainless Steel probes are suitable for granular or liquid material that is not electrically conductive. For electrically conductive material, in some applications, a coated (insulated) probe may need be used for the unit to effectively sense the material. Contact BinMaster if there are any questions about which probe to use for a specific application.

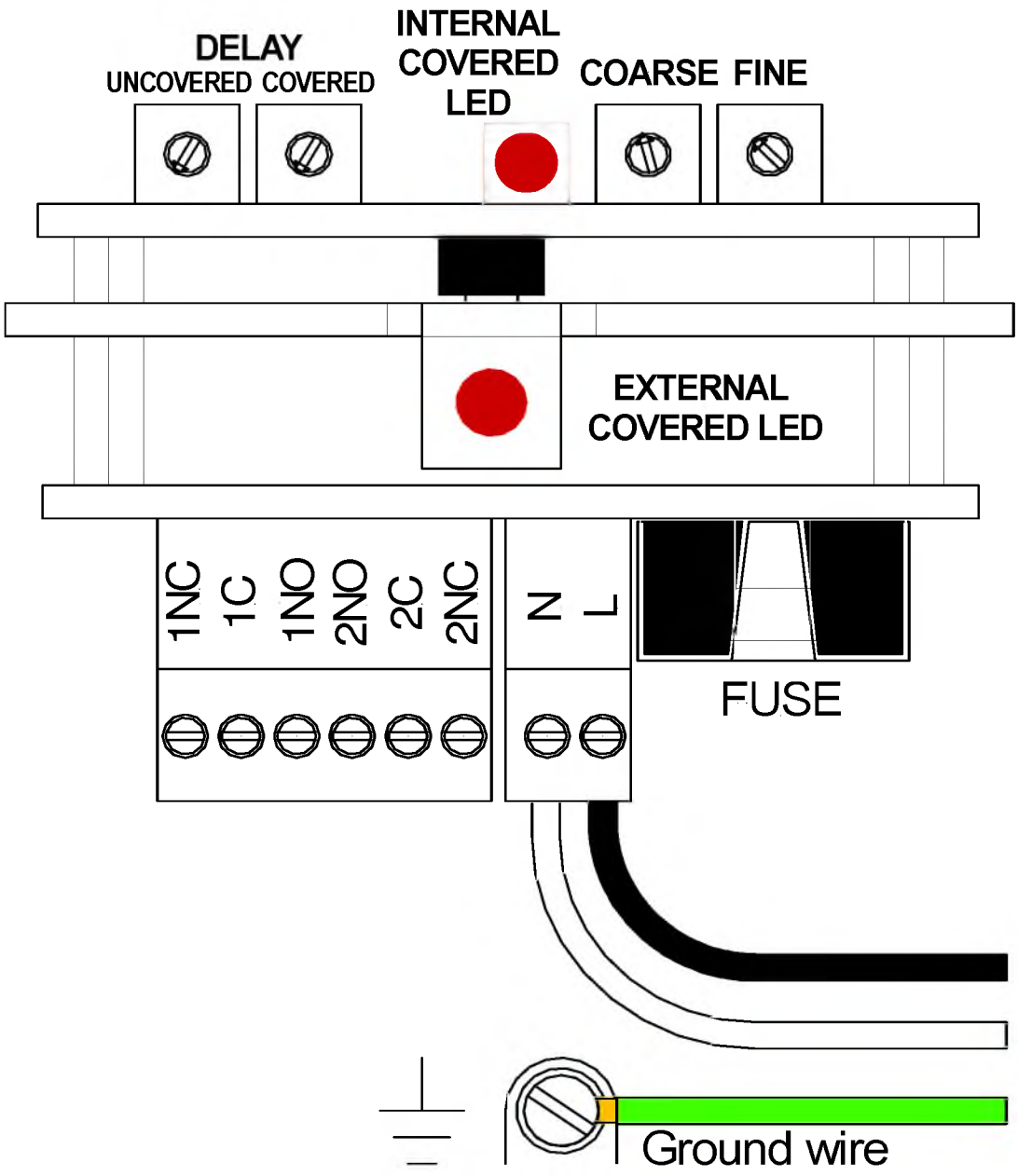
3.0 INSTALLATION

3.1 Location and Mounting

The probe should be located out of the direct flow of material. The PROCAP I is designed to mount utilizing either a 1 1/4" NPT coupling or 3/4" NPT coupling. When the PROCAP I is used with the flush mount probe, the flush mount probe mounts directly to the vessel wall using a 7" diameter bolt circle. Refer to Figures 1.1 and 1.2 for illustrations on installation, mounting options, and different probe combinations.

3.2 Input Power and Field Wiring

The PROCAP I can be powered from either an AC or a DC power source with a voltage range from 24 up to 240 volts. The power source can be either grounded or ungrounded. If powered from a grounded source the grounded circuit conductor should be connected to the N terminal. In this way the ungrounded circuit conductor is fused on the circuit board. A disconnecting means should be provided to disconnect incoming power to this device. Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation. For power input, use wire that is sized and rated for the maximum voltage and current as per equipment ratings and has a temperature rating of at least 70 degrees C For relay output, use wire that is sized and rated for the maximum voltage and current as per application, up to 250VAC 10A, and has a temperature rating of at least 70 degrees C . Installation shall be done by qualified personnel.



3.3 Grounding

An equipment grounding connection (earth ground) **must** be supplied to the unit for safety and to insure proper operation of the unit. A green ground screw is provided in the enclosure for connection of an equipment grounding conductor as shown in the figure above. This unit uses earth ground as a reference for calibration and detecting a covered or uncovered condition. Therefore, the vessel in which the PROCAP I is mounted must be made of metal, or a suitable metal ground plate must be installed where the PROCAP I is mounted.

4.0 FAIL-SAFE SELECTION

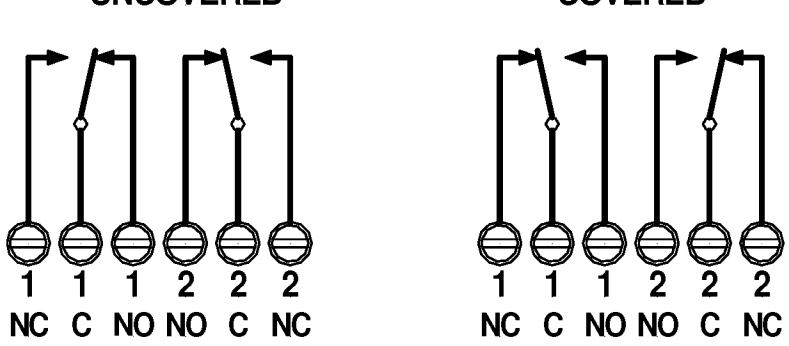
4.1 Description

A Fail-Safe condition means that the relay contact positions are set up so that in the event of a power failure the relay will be de-energized and the contacts will indicate a condition that is deemed safe for the application. (Refer to FIGURE 2.1 for the location of the Fail-Safe selection switch.)

4.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is covered whether it is or not.

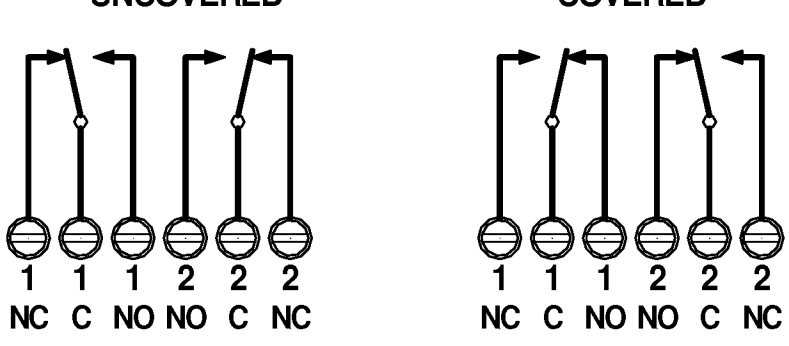
FAIL SAFE "HIGH" RELAY CONTACT POSITION



4.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the probe is uncovered and will energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is uncovered whether it is or not.

FAIL SAFE "LOW" RELAY CONTACT POSITION



5.0 CALIBRATION

The PROCAP I Quick Set calibration uses two single turn potentiometers making calibration very simple. One potentiometer labeled COARSE is used to compensate for the capacitance of the empty vessel. The other potentiometer labeled FINE is used to set in the desired sensitivity. Refer to FIGURE 2.1 for the location of these potentiometers on the printed circuit board.
NOTE: Accurate calibration requires that the appropriate probe is attached to the PROCAP I and the unit installed in the vessel. The probe must be UNCOVERED and material well below it.

5.1 Calibration Verification

Following calibration adjustment, the sensitivity setting that you have selected should be checked by verifying that the PRO CAP II senses a covered probe condition with your material.

5.2 Calibration Procedure

WARNING: During Calibration. this unit will need to be energized. Care should be taken to not come in contact with any live voltage in the area around the terminal blocks and fuse!

CAUTION: The Calibration potentiometers are delicate electronic devices, do not use excessive force when adjusting.

1. Turn both the COARSE and FINE potentiometers fully counter clockwise (CCW). The internal COVERED indicator light should be OFF.

2. Turn the COARSE potentiometer slowly clockwise (CW) to the point where the COVERED indicator light just turns ON and stays on.

3. Turn the FINE potentiometer slowly clockwise (CW) until the COVERED indicator light just turns OFF. (If the COARSE potentiometer has been carefully adjusted, this should occur when the FINE potentiometer is between the 8 and 10 O'clock position.) Now continue to turn the FINE potentiometer clockwise (CW) to the desired sensitivity setting.

HIGH sensitivity:	1/16 turn
MEDIUM sensitivity:	1/8 turn
LOW sensitivity:	1/4 to 1/2 turn

NOTE: It may be convenient to think of the FINE potentiometer as a clock face and envision the distance between consecutive hour numbers. Turning the FINE potentiometer clockwise one hour position past the point at which the COVERED indicator just turns OFF would provide a high sensitivity setting. Two-hour positions past that point would provide a medium sensitivity setting..

5.3 Sensitivity Selection

Sensitivity Setting (typical)	Dielectric Constant of Material
HIGH sensitivity:	4 or less
MEDIUM sensitivity:	4 to 10
LOW sensitivity:	10 or higher

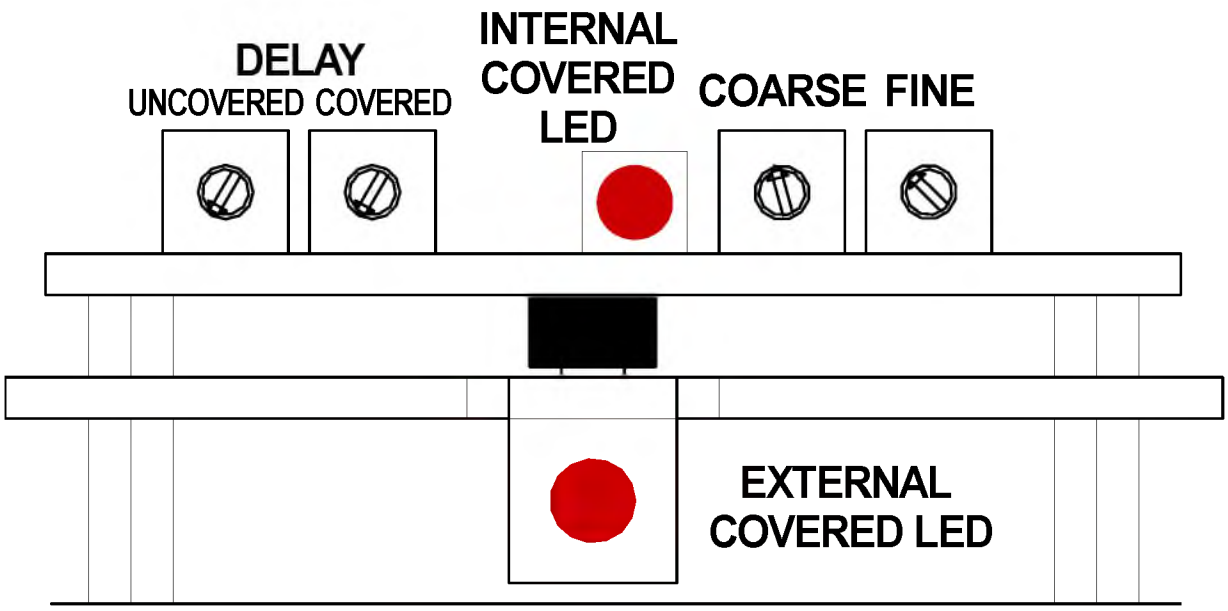
6.0 EXTERNAL VIEW LED

PROCAP I models include an external view LED. PROCAP I X models do not have an external view LED. This LED provides an externally visible status indication for the PROCAP I. When this LED is flashing, it indicates a normal **Uncovered** condition. When this LED is ON steady, it indicates a **Covered** condition. When this LED is OFF, it indicates a power failure or fault condition. This external LED is affected by any time delay set for the relay contacts.

7.0 TIME DELAY

The PROCAP I has two single turn adjustable time delay potentiometers. The Delay potentiometer labeled **UNCVR** is for applying a time delay on going from a **covered indication to an uncovered indicatio**n. The Delay potentiometer labeled **CVR** is for applying a time delay on going from **an uncovered indication to an covered indication**. Each potentiometer can be set for a time delay of up to approximately 30 seconds. **This time delay affects the relay contacts and external LED only.** The internal Covered LED will immediately respond to a change in covered or uncovered condition regardless of the time delay setting.

Minimum time delay is when the DELAY potentiometers are set fully counter-clockwise. (Refer to the Figure below for the location of the DELAY potentiometers.) Maximum time delay is with the DELAY potentiometer set fully clockwise.



8.0 WARRANTY AND CUSTOMER SERVICE

8.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.) This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied.

EXPLOSION HAZARD-SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

8.2 Custom Service

Bin Master offers a toll-free Customer Service phone number **1-800-278-4241.** You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via **fax** at **(402) 434-9133**.

9.0 DISPOSAL

This product consists of materials that can be recycled by specialized recycling companies. It uses recyclable materials and the electronics is designed to be easily separated. Consult local authorities for proper disposal locations.

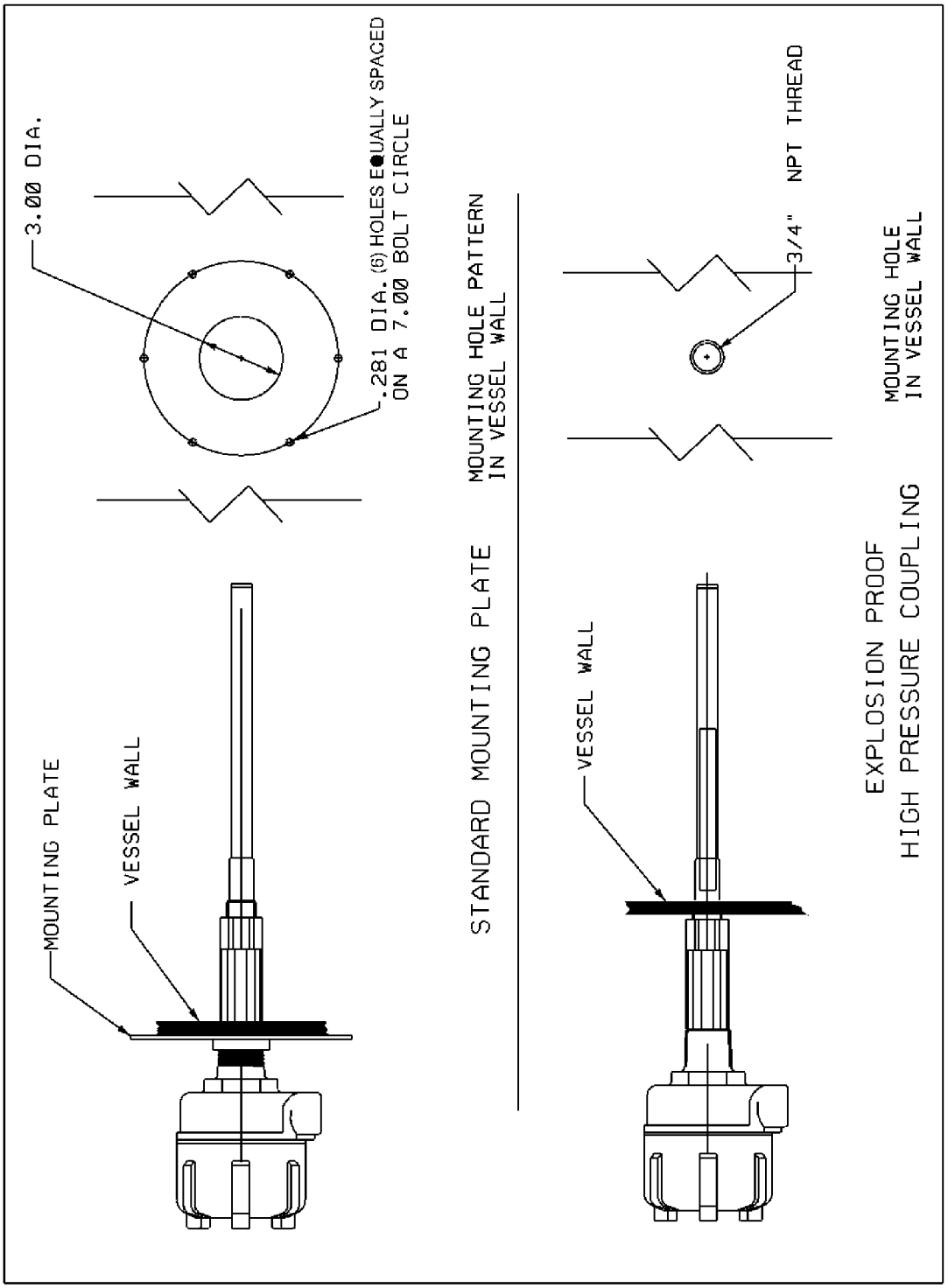


Figure 1.1

When the PROCAP I is used for liquid applications the stainless steel threads must be used to insure a proper seal.

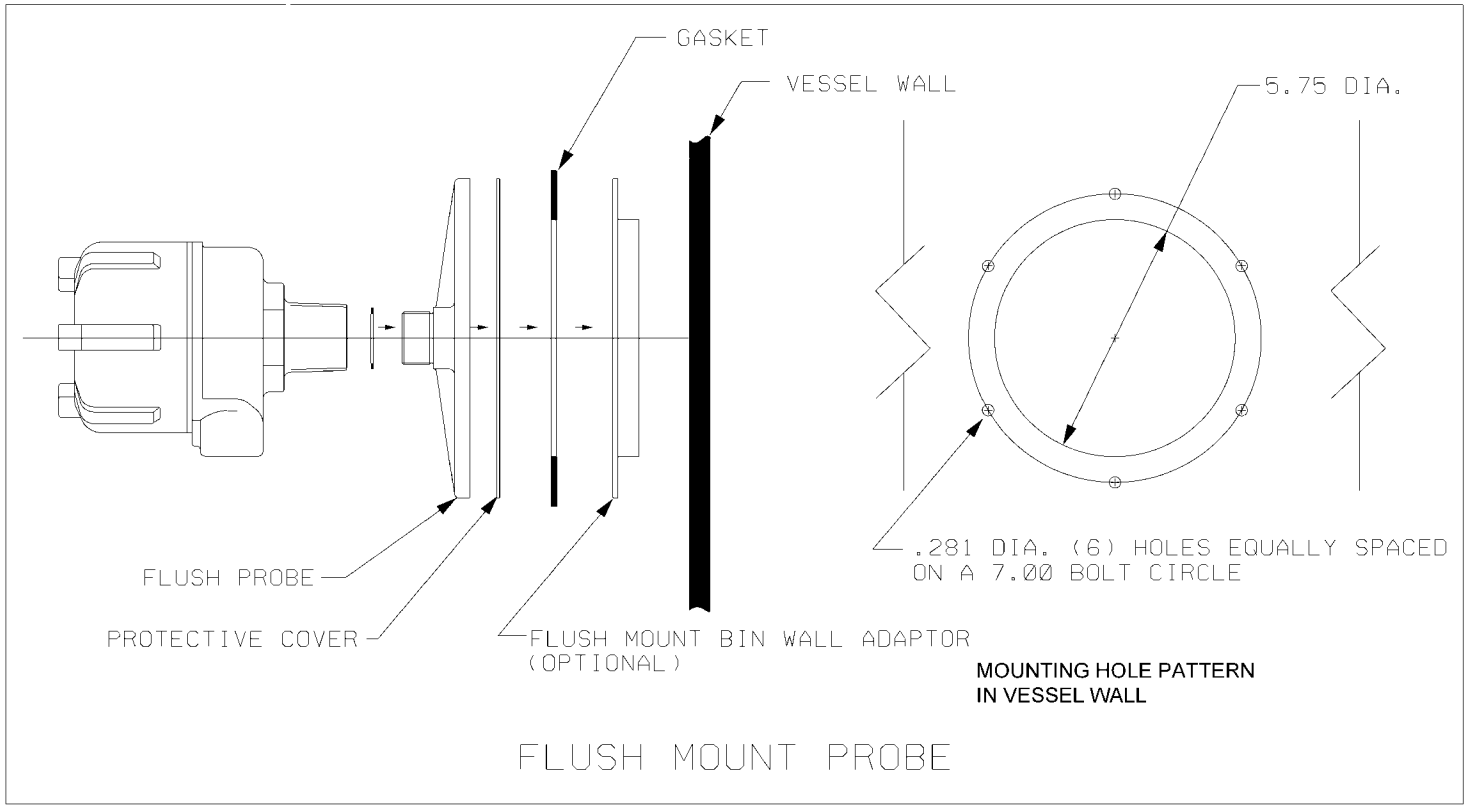

GASKET
VESSEL WALL
5.75 DIA.
FLUSH PROBE
PROTECTIVE COVER
FLUSH MOUNT BIN WALL ADAPTOR
(OPTIONAL)
.281 DIA. (6) HOLES EQUALLY SPACED
ON A 7.00 BOLT CIRCLE
MOUNTING HOLE PATTERN
IN VESSEL WALL
FLUSH MOUNT PROBE

Figure 1.2

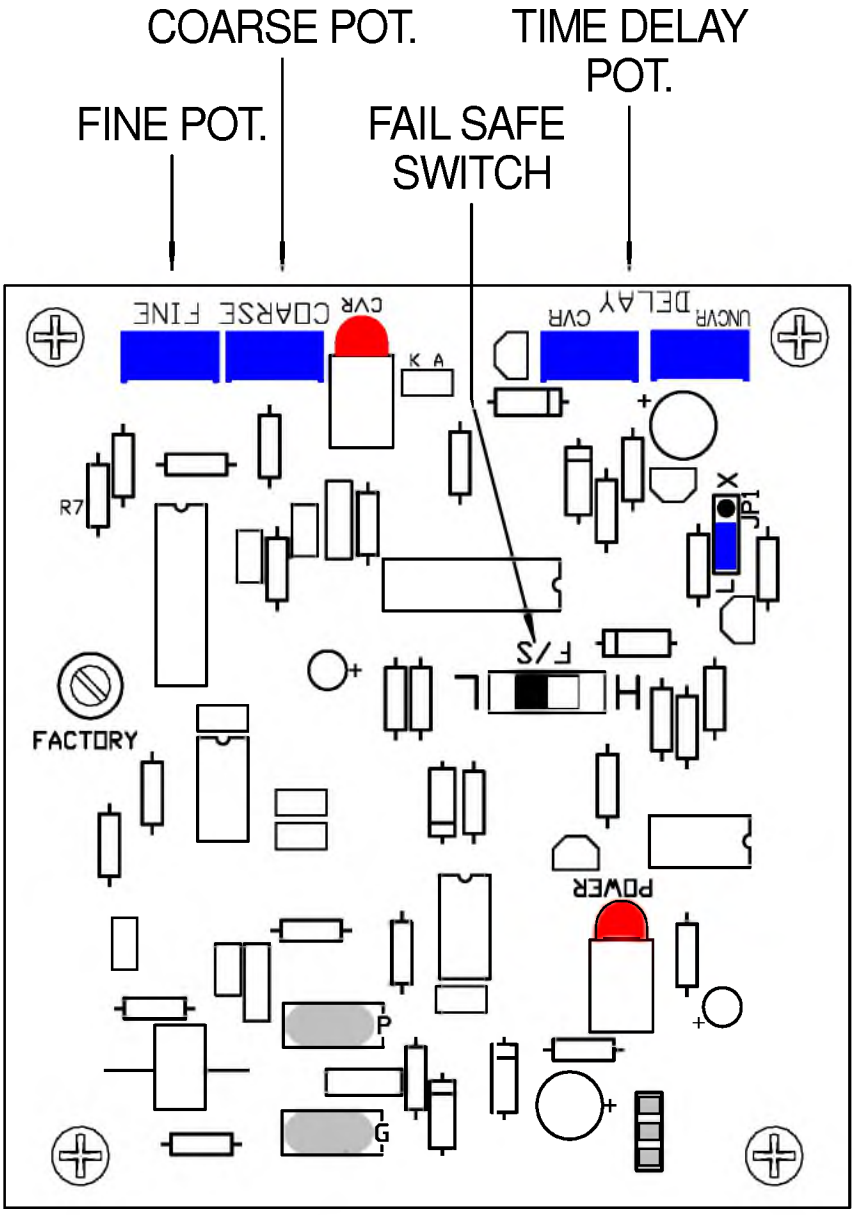

COARSE POT.
TIME DELAY POT.
FINE POT.
FAIL SAFE SWITCH
CVR
COARSE FINE
UNCVR
DELAY CVR
K A
R7
F/S
L
H
FACTORY
POWER
P
G

FIGURE 2.1

Declaration of Conformity

BinMaster declares that the PROCAP I and PROCAP IX level control devices as listed below comply with the following directives and harmonized standards. This product if installed, operated and maintained as described in this manual will provide a safe and reliable point level control device for bulk solid materials.

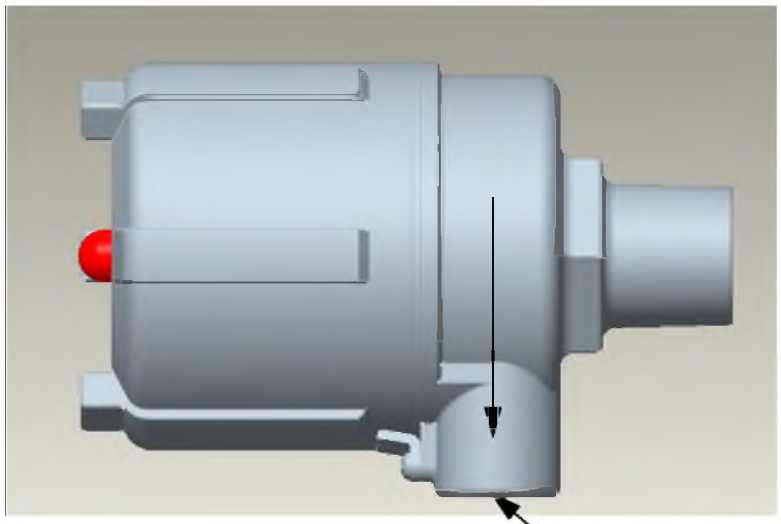
Low Voltage Directive 73/23/EEC
Standard IEC 61010-1:2001

Product: Capacitance point level control device.
Models: PROCAP I and PROCAP IX

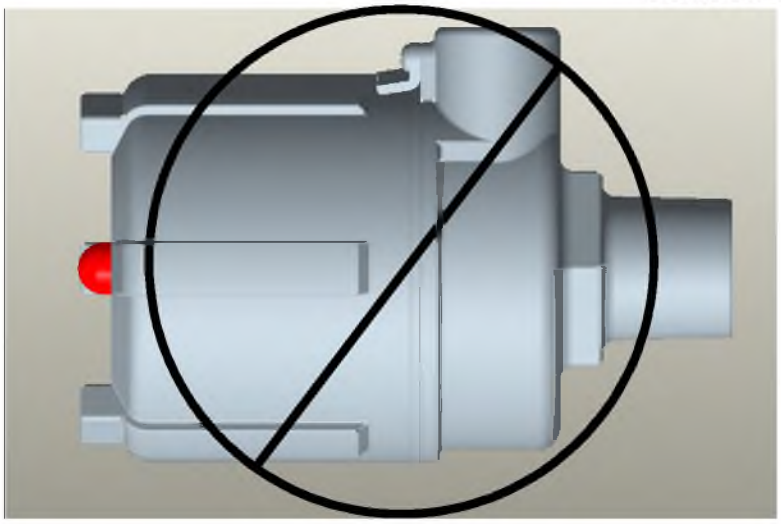
All test reports and documentation are held and can be obtained from BinMaster.

Manufacturing Location: Lincoln, Nebraska, USA

Mounting Instructions



Always Mount Unit With
Conduit opening down



Conduit Seal

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure through the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

Price $5.00

BINMASTER®

PROCAP II Series
CAPACITANCE PROBE

OPERATING INSTRUCTIONS
PLEASE READ CAREFULLY

BINMASTER®

925-0291 Rev A

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PROCAP II
GENERAL SPECIFICATIONS

Supply:		115/230 VAC 50/60 Hz (selectable)
Supply Tolerance:		-15% +10%
Load:		2.2VA
Ambient Temperature: (Electronics)		-40° F to +158° F (-40° C to +70° C)
Sensitivity:		1 picofarad
Enclosure:	PROCAP II	Type 4X, 5, 9, & 12 (HAZ LOC CL II E, F, & G)
	PROCAP II X	Type 4X, 5, 7, 9, & 12 (HAZ LOC CL I C&D; CL II E,F, & G)
Relay Output:		DPDT contacts; 10 Amps 250 VAC
Fail-Safe:		Switch selectable "High" or "Low" level modes.
Calibration:		Set when probe is uncovered: COARSE adjust; single turn potentiometer FINE adjust; single turn potentiometer
Status Indicator:		Internal LED indicates material in contact with probe. PROCAP II has an external LED also
Time Delay:		Independently adjustable up to 30 seconds
Probe Shield:		Automatically compensates for material buildup on the probe
Mounting:		1 1/4" or 3/4" NPT - When used in liquid applications the stainless steel threads must be used to insure a proper seal.
Conduit Entry:		3/4" NPT

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all National and Local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Properly ground the enclosure to an adequate earth ground.

Observe all terminal and relay contact ratings as called out on the nameplate and in the installation manual.

Insure that the enclosure cover is in place and secured tightly during normal operation.

If this product is used in a manner not specified by the manufacturer the safety protection could be compromised.

Safety Terms and Symbols

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

1.0 INTRODUCTION

The Bin-Master PROCAP II is a point level control used to detect the presence or absence of solids or liquids. The PROCAP II operates on the capacitance principle and incorporates a "Quick Set" feature to simplify calibration. The PROCAP II includes switch selectable Fail-Safe output contacts and "Probe Shield" technology for ignoring material build up.

Upon installation the PROCAP II is set up with the probe uncovered. The "Quick Set" feature allows simple setup and calibration of the unit to achieve low, medium, or high sensitivity settings. The PRO CAP II has an adjustable time delay for monitoring covered or uncovered conditions.

2.0 APPLICATIONS

For applications in pressurized vessels up to 500 PSI, the PROCAP II should be mounted with the 3/4" or 1 1/4" stainless steel threads. **When the PROCAP II is used in liquid applications the stainless steel threads must be used to insure a proper seal.**

Process temperatures for the various probes are:

1. Delrin Sleeved Stainless Steel:	250 Deg. F
2. Teflon Sleeved Stainless Steel:	500 Deg. F
3. Flush Mount (Polyethylene):	180 Deg. F
4. Flush Mount (Teflon):	450 Deg. F
5. Bare Stainless Steel:	250 Deg. F
6. Flexible Extension:	250 Deg. F

The Delrin or Teflon sleeved stainless steel probe should be used when mounting the PROCAP II In a highly corrosive atmosphere. Bare metal Stainless Steel probes are suitable for granular or liquid material that is not electrically conductive. For electrically conductive material, a coated (insulated) probe must be used.

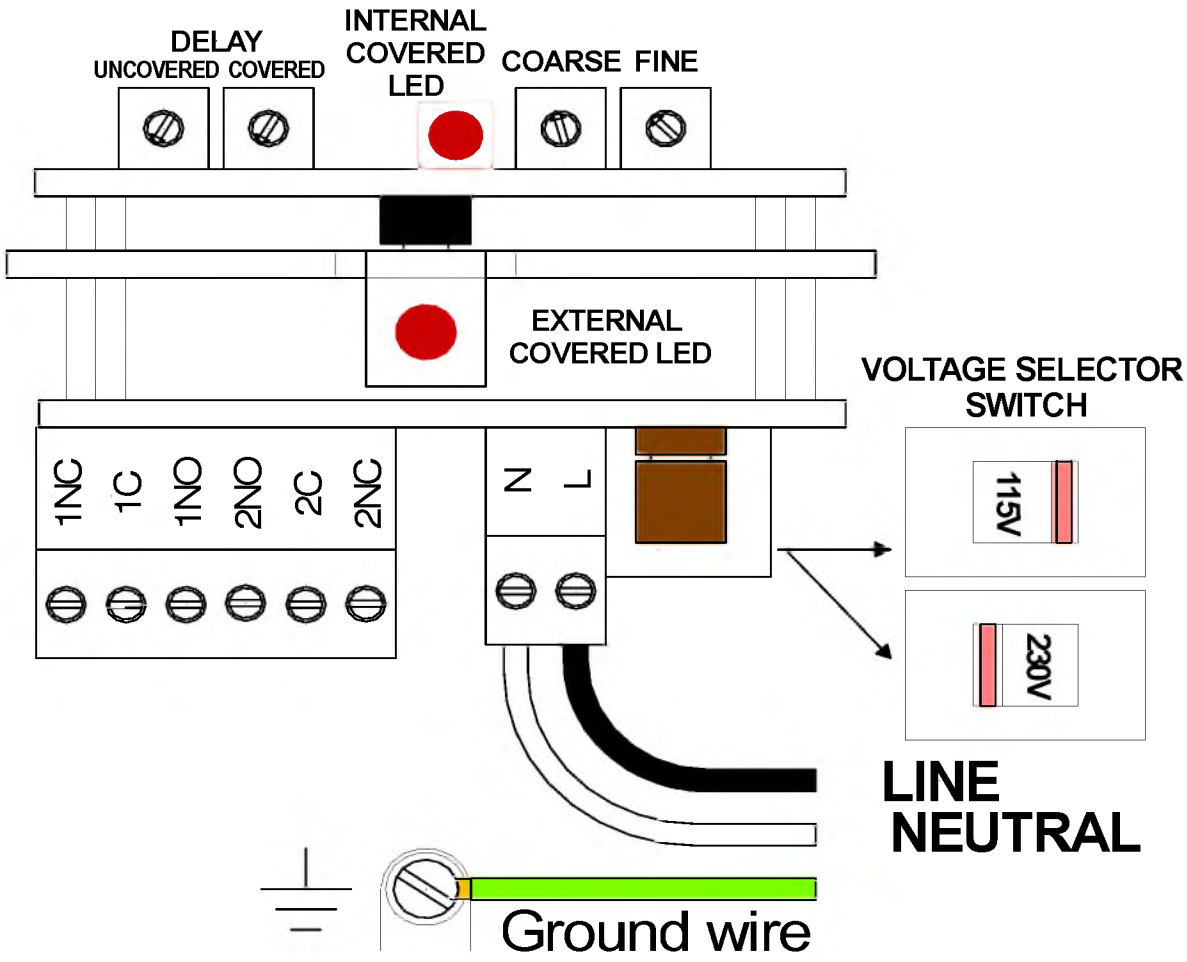
3.0 INSTALLATION

3.1 Location and Mounting

The probe should be located out of the direct flow of material. The PROCAP II is designed to mount utilizing either a 1 1/4" NPT coupling or 3/4" NPT coupling. When the PROCAP II is used with the flush mount probe, the flush mount probe mounts directly to the vessel wall using a 7" diameter bolt circle. Refer to Figures 1.1 through 1.4 for illustrations on installation, mounting options, and different probe combinations.

3.2 Input Power and Field Wiring

The PROCAP II can be powered from either a 115 VAC or 230 VAC supply (see diagram below). ***The Voltage selector switch must be put in the correct voltage position of the power supplied to the LINE input terminals N and L.*** Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation.



3.3 Grounding

An equipment grounding connection (earth ground) **must** be supplied to the unit for safety and to insure proper operation of the unit. This unit uses earth ground as a reference for calibration and detecting a covered or uncovered condition. Therefore, the vessel in which the PROCAP II is mounted must be made of metal, or a suitable metal ground plate must be installed where the PROCAP II is mounted.

4.0 FAIL-SAFE SELECTION

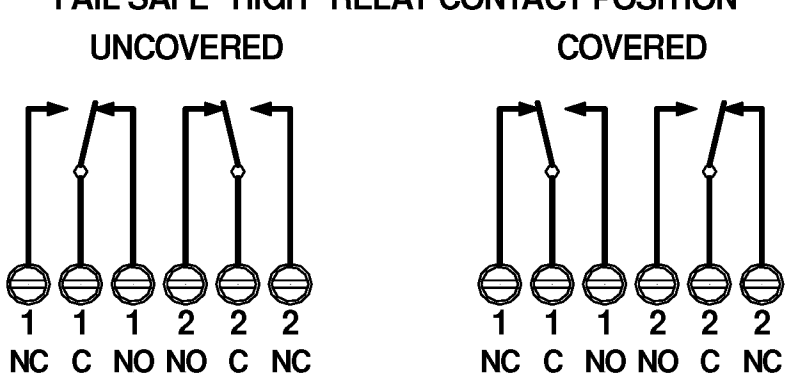
4.1 Description

A Fail-Safe condition means that the relay contact positions are set up so that in the event of a power failure the relay will be de-energized and the contacts will indicate a condition that is deemed safe for the application. (Refer to FIGURE 2.1 for the location of the Fail-Safe selection switch.)

4.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is covered whether it is or not.

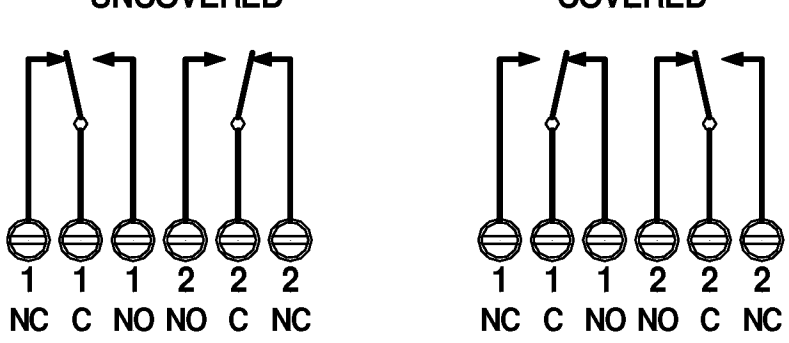
FAIL SAFE "HIGH" RELAY CONTACT POSITION



4.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the probe is uncovered and will energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is uncovered whether it is or not.

FAIL SAFE "LOW" RELAY CONTACT POSITION



5.0 CALIBRATION

The PROCAP II Quick Set calibration uses two single turn potentiometers making calibration very simple. One potentiometer labeled COARSE is used to compensate for the capacitance of the empty vessel. The other potentiometer labeled FINE is used to set in the desired sensitivity. Refer to FIGURE 2.1 for the location of these potentiometers on the printed circuit board. A tool for adjusting the COARSE and FINE potentiometers is provided inside the top cover of the PROCAP II. The cover has a convenient clip for storing the tool so it will always be available.

NOTE: Accurate calibration requires that the appropriate probe is attached to the PROCAP II and the unit installed in the vessel. The probe must be UNCOVERED and material well below it.

5.1 Calibration Verification

Following calibration adjustment, the sensitivity setting that you have selected should be checked by verifying that the PRO CAP II senses a covered probe condition with your material.

5.2 Calibration Procedure

CAUTION: The Calibration potentiometers are delicate electronic devices, do not use excessive force when adjusting.

1. Turn both the COARSE and FINE potentiometers fully counter clockwise (CCW). The internal COVERED indicator light should be OFF.

2. Turn the COARSE potentiometer slowly clockwise (CW) to the point where the COVERED indicator light just turns ON and stays on.

3. Turn the FINE potentiometer slowly clockwise (CW) until the COVERED indicator light just turns OFF. (If the COARSE potentiometer has been carefully adjusted, this should occur when the FINE potentiometer is between the 8 and 10 O'clock position.) Now continue to turn the FINE potentiometer clockwise (CW) to the desired sensitivity setting.

HIGH sensitivity:	1/16 turn
MEDIUM sensitivity:	1/8 turn
LOW sensitivity:	1/4 to 1/2 turn

NOTE: It may be convenient to think of the FINE potentiometer as a clock face and envision the distance between consecutive hour numbers. Turning the FINE potentiometer clockwise one hour position past the point at which the COVERED indicator just turns OFF would provide a high sensitivity setting. Two-hour positions past that point would provide a medium sensitivity setting..

5.3 Sensitivity Selection

Sensitivity Setting (typical)	Dielectric Constant of Material
HIGH sensitivity:	4 or less
MEDIUM sensitivity:	4 to 10
LOW sensitivity:	10 or higher

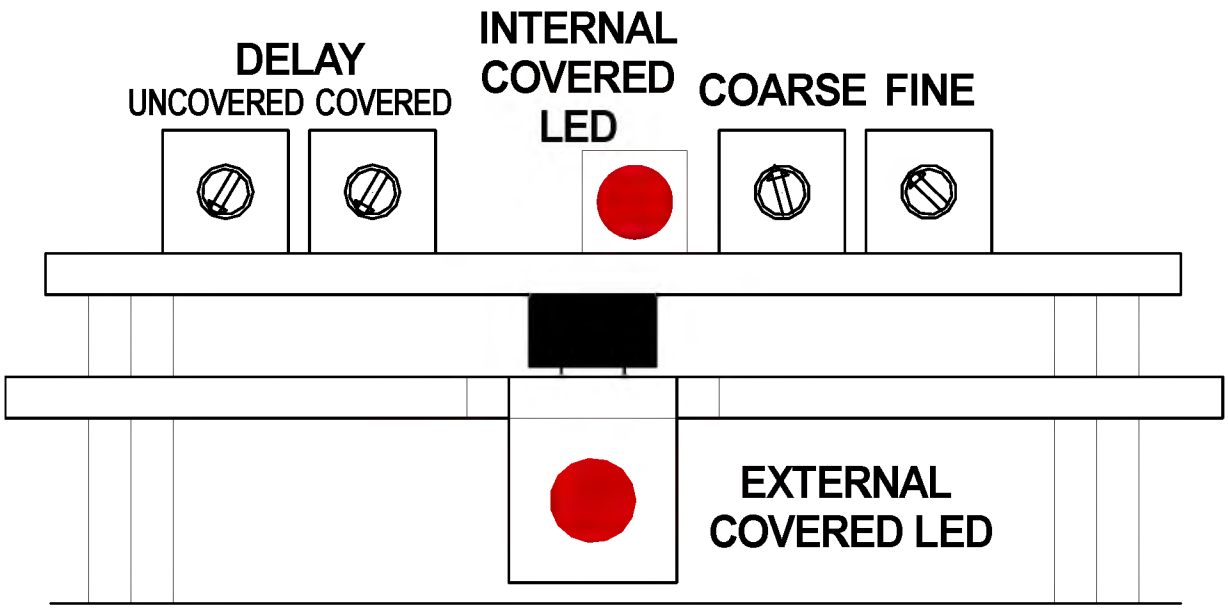
6.0 EXTERNAL VIEW LED

PROCAP II models include an external view LED. PROCAP II X models do not have an external view LED. This LED provides an externally visible status indication for the PROCAP II. When this LED is flashing, it indicates a normal **Uncovered** condition. When this LED is ON steady, it indicates a **Covered** condition. When this LED is OFF, it indicates a power failure or fault condition. This external LED is affected by any time delay set for the relay contacts.

7.0 TIME DELAY

The PROCAP II has two single turn adjustable time delay potentiometers. The Delay potentiometer labeled **UNCVR** is for applying a time delay on going from a **covered indication to an uncovered indication**. The Delay potentiometer labeled **CVR** is for applying a time delay on going from **an uncovered indication to an covered indication**. Each potentiometer can be set for a time delay of up to approximately 30 seconds. **This time delay affects the relay contacts and external LED only.** The internal Covered LED will immediately respond to a change in covered or uncovered condition regardless of the time delay setting.

Minimum time delay is when the DELAY potentiometers are set fully counter-clockwise. (Refer to the Figure below for the location of the DELAY potentiometers.) Maximum time delay is with the DELAY potentiometer set fully clockwise.



8.0 WARRANTY AND CUSTOMER SERVICE

8.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.)This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied.

EXPLOSION HAZARD-SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

8.2 Custom Service

Bin Master offers a toll-free Customer Service phone number **1-800-278-4241.** You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via **fax** at **(402) 434-9133**.

9.0 DISPOSAL

This product consists of materials that can be recycled by specialized recycling companies. It uses recyclable materials and the electronics is designed to be easily separated. Consult local authorities for proper disposal locations.

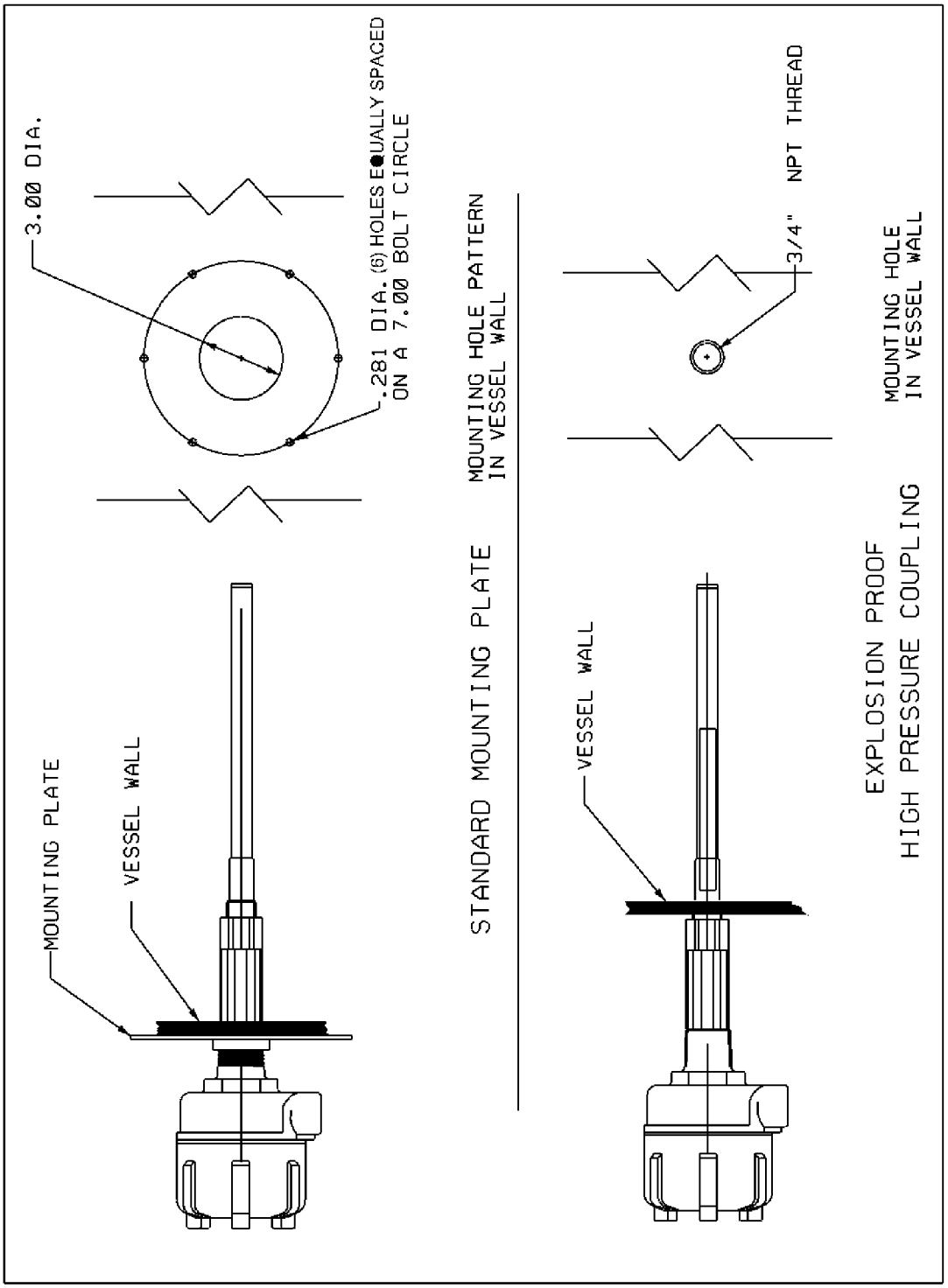


Figure 1.1

When the PROCAP II is used for liquid applications the stainless steel threads must be used to insure a proper seal.

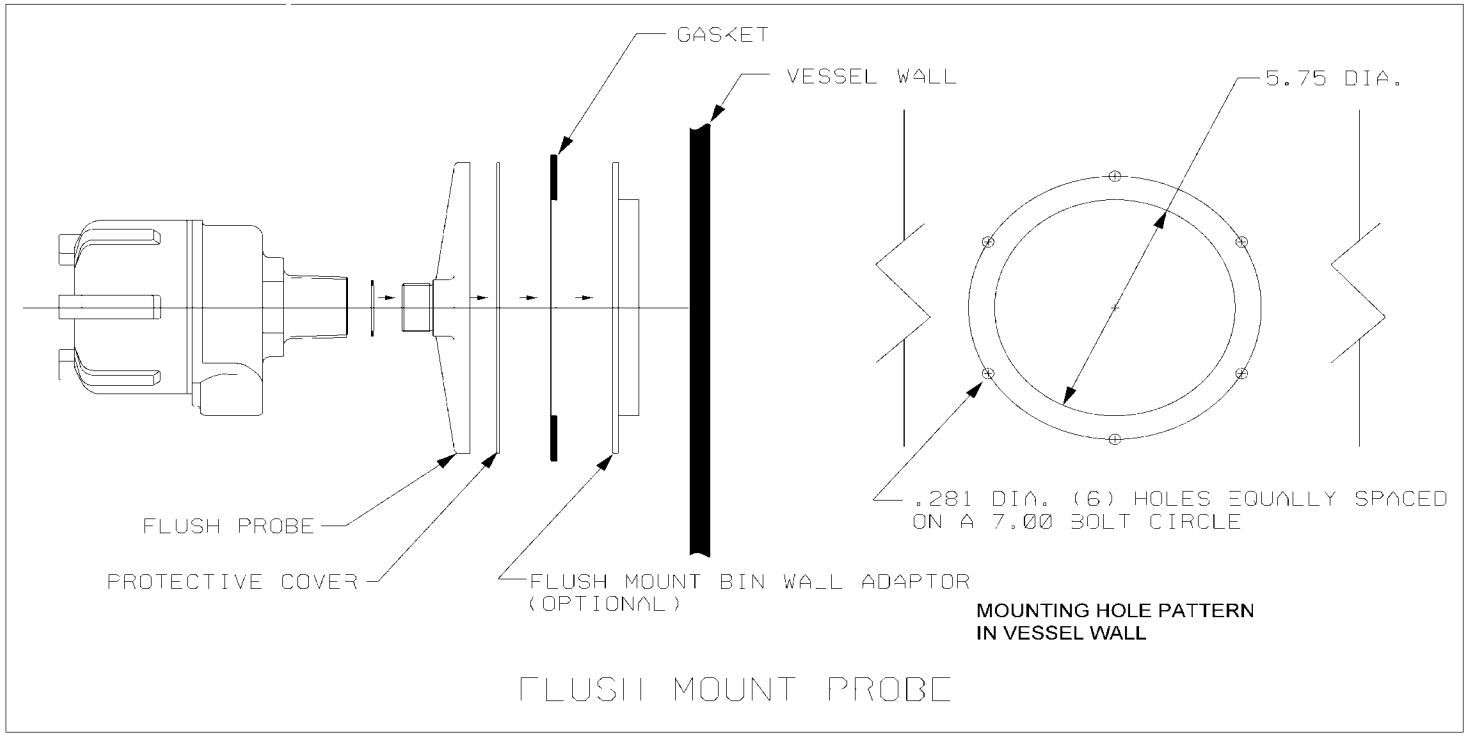

GASKET
VESSEL WALL
5.75 DIA.
FLUSH PROBE
PROTECTIVE COVER
FLUSH MOUNT BIN WALL ADAPTOR
(OPTIONAL)
.281 DIA. (6) HOLES EQUALLY SPACED
ON A 7.00 BOLT CIRCLE
MOUNTING HOLE PATTERN
IN VESSEL WALL
FLUSH MOUNT PROBE

Figure 1.2

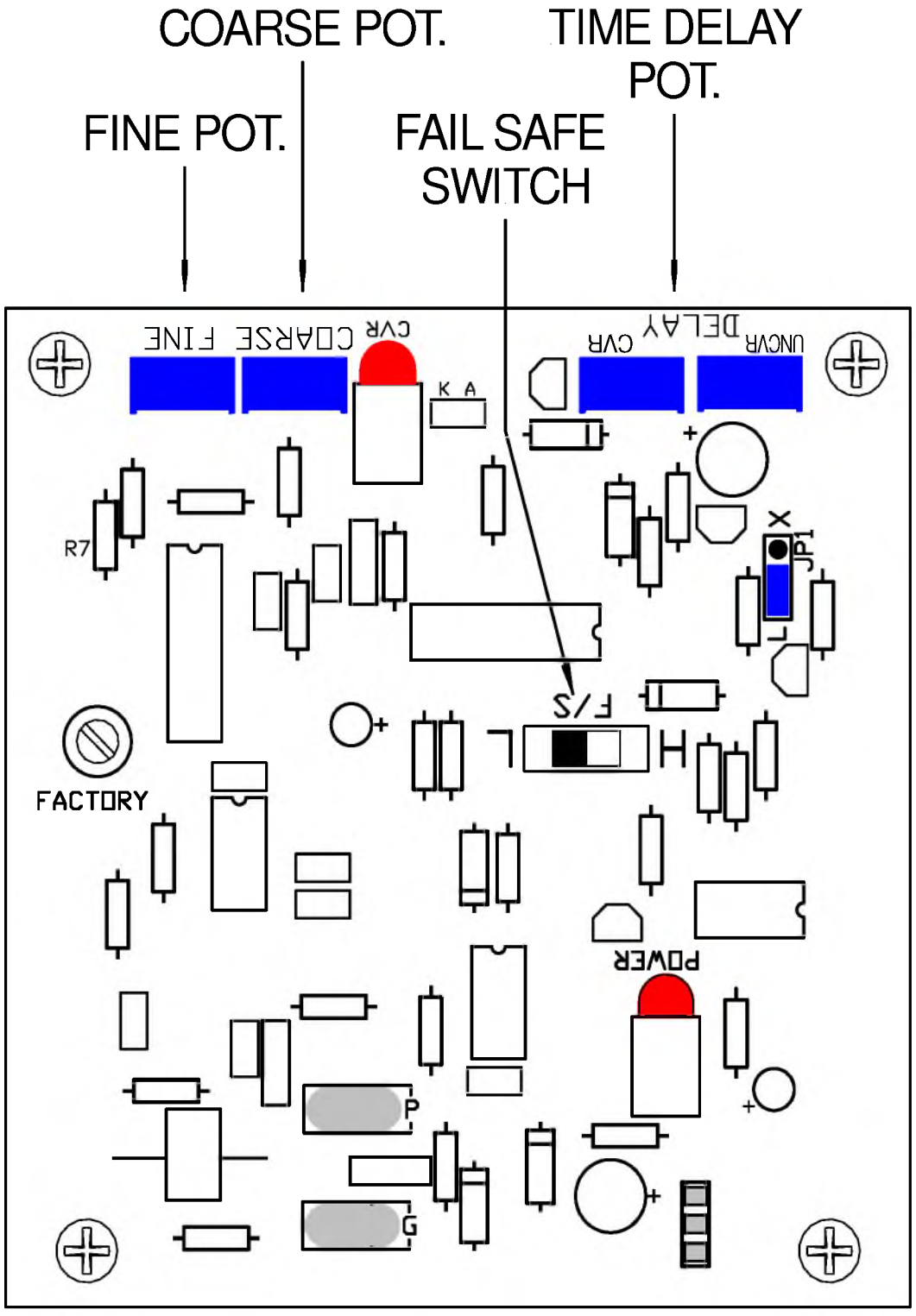

COARSE POT.
TIME DELAY POT.
FINE POT.
FAIL SAFE SWITCH
COARSE FINE
CVR
DELAY CVR
UNCVR
K A
R7
JP1
F/S
L
H
FACTORY
POWER
P
G

FIGURE 2.1

Declaration of Conformity

BinMaster declares that the PROCAP II and PROCAP IIX level control devices as listed below comply with the following directives and harmonized standards. This product if installed, operated and maintained as described in this manual will provide a safe and reliable point level control device for bulk solid materials.

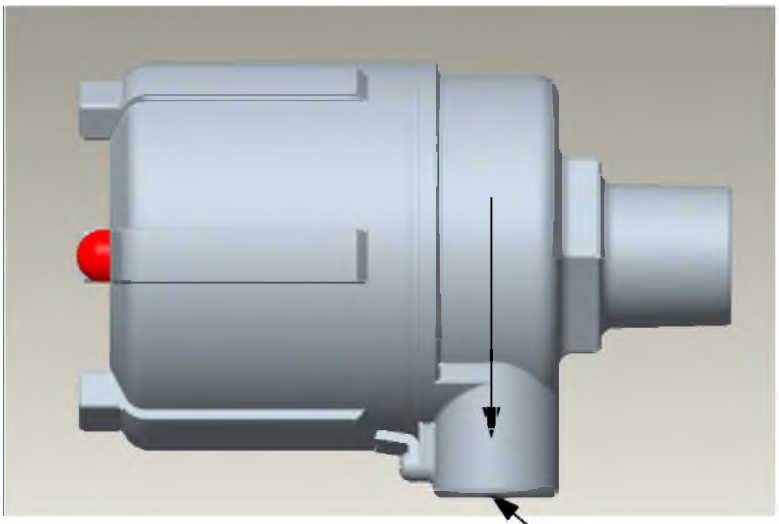
Low Voltage Directive 73/23/EEC
Standard IEC 61010-1:2001

Product: Capacitance point level control device.
Models: PROCAP II and PROCAP IIX

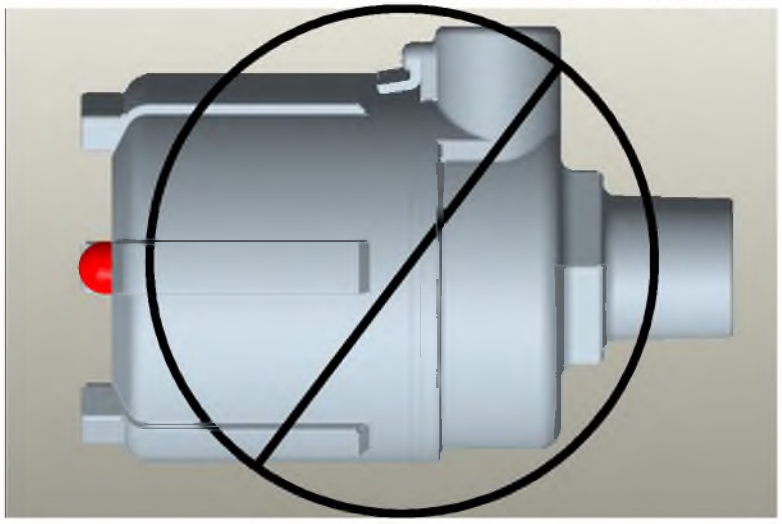
All test reports and documentation are held and can be obtained from BinMaster.

Manufacturing Location: Lincoln, Nebraska, USA

Mounting Instructions



Always Mount Unit With
Conduit opening down



Conduit Seal

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure through the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

VR-21, VR-41, & VR-51
VIBRATING ROD

OPERATING INSTRUCTIONS
PLEASE READ CAREFULLY

925-0307 Rev D

TABLE OF CONTENTS

VR-21, VR-41, & VR-51
GENERAL SPECIFICATIONS

Power Supply:	20 to 250 V AC/DC
Power Consumption:	3VA
Ambient Temperature: (Electronics)	-4° F to +140° F (-20° C to +60° C)
Process Temperature: (Probe)	-4° F to +176° F (-20° C to +80° C)
Enclosure:	Powder Coated: Type 4X, 5, & 12 Bare Aluminum: Type 4, 5, & 12
Relay Output:	DPDT contacts; 5 Amps 250 VAC
Fail-Safe:	Selectable "High" or "Low" level modes.
Mounting:	VR-21, VR-41, & VR-51 = 1 1/2" NPT
Conduit Entries:	3/4" NPT
Minimum Material Density:	1.9 lb. / cu. ft (30 g/ liter)

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all National and Local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Properly ground the enclosure to an adequate earth ground.

Observe all terminal and relay contact ratings as called out on the nameplate and in the installation manual.

Ensure that the enclosure cover is in place and secured tightly during normal operation.

If this product is used in a manner not specified by the manufacturer the safety protection could be compromised.

Safety Terms and Symbols

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

1.0 INTRODUCTION

The BinMaster VR vibrating rods are point level controls used to detect the presence or absence of granular or powdered material. The vibrating rod operates by exciting the blade of unit to causing it to vibrate at its mechanical resonance frequency of about 290 Hz. When material covers the blade of the probe, the vibration stops. This is sensed by the electronic circuitry causing the relay contacts to change status. When the blade becomes uncovered, the vibration will restart and the relay contacts will change back. Since only the end of the vibrating blade is sensitive and not the base, buildup on the vessel wall has no influence on the sensor. The shape of the blade and its vibration have a self cleaning effect.

2.0 APPLICATIONS

The BinMaster VR vibrating rod can be used in bins, silos, and hoppers to detect many different granular or powdered materials. The following list shows some of these materials:

Animal feed	Powdered cellulose
Beans	Powdered clay
Chalk	Powdered milk
Coffee beans	Salt
Coffee (freeze-dried)	Soda ash
Coffee (ground)	Soot (dry pellets)
Flour	Spices
Foundry sand	Styrene chips
Frozen potato chips	Sugar
Glass (finely ground)	Sweets
Granular plastics	Styrofoam
Gravel	Tea (leaf)
Peanuts	Tobacco
Polystyrene powder	Wood shavings

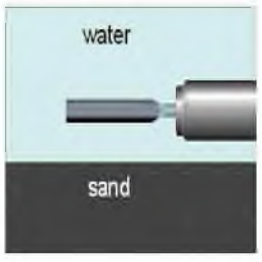
3.0 VERSIONS

The BinMaster VR is available in 3 different versions:

- VR-21 - 1 1/2 in. NPT mount, standard insertion length 7.5 in. (190mm)
- VR-41 - 1 1/2 in. NPT mount, with threaded pipe extension for insertion length from 14 in. up to 13 ft.
- VR-51 - 1 1/2 in. NPT mount, with cable extension for insertion length from 18 in. up to 19.5 ft.

3.1 SPECIAL SEDIMENT MODEL

Application: The BinMaster VR-SED is a special configuration of the VR-21 / VR-41 level control instrument. It is designed to detect the level of solid material that has settled in water. A typical application is the detection of sand in front of pumping systems.



Function: A piezo system brings rod to vibrate at its resonant frequency. The vibrating system is tuned to work in water. If solid material covers the rod, it damps the vibration. An electronics circuit switches a binary output signal. When the rod gets uncovered, it starts vibrating again and the output switches back.

SPECIAL INSTRUCTIONS FOR SEDIMENT MODEL VIBRATING ROD

General: This special sediment model vibrating rod is tuned to work (vibrate) in water. This means that it may not vibrate in air which would result in a covered indication. To test the sediment model vibrating rod, you have to put the vibrating blade into water. The sediment model is not usable for detecting liquids or solids in air. The blade of the BinMaster VR-SED must have a distance of at least 4 inches (100mm) to the container wall. If the blade gets closer than this to the container wall, then the vibration could be damped by reflections of the container wall.

Sensitivity: For the sediment model vibrating rod, only the sensitivity settings B or C can be used. This setting depends on the weight of the settled material and the water/material mixture.

B Higher sensitivity: The vibration gets damped earlier than on position C. Depending on the density of the material, the relay will switch when the water/material mixture on top of the settlement just reaches the vibrating blade.

C Lower sensitivity: The vibration gets damped later than on position B when the vibrating blade gets fully covered by the settled material.

4.0 INSTALLATION

4.1 Location and Mounting

Figure 1 shows the typical installation possibilities of the BinMaster VR units.

The BinMaster VR is installed by screwing the male mounting threads into a 1 1/2" NPT coupling or mounting flange. Use a 2 inch (50mm) wrench to tighten the unit into the mounting socket. If side mounting the VR, it must be turned until the blade is vertically oriented, so that material can flow freely over the blade and does not rest on it causing false alarms. Use the round indention on the 2 in. hex collar to identify the blade orientation. When the indention is up the blade is oriented correctly. Refer to Figure 1 for a view of blade orientation

WARNING: *Do not screw in by turning the enclosure housing!*

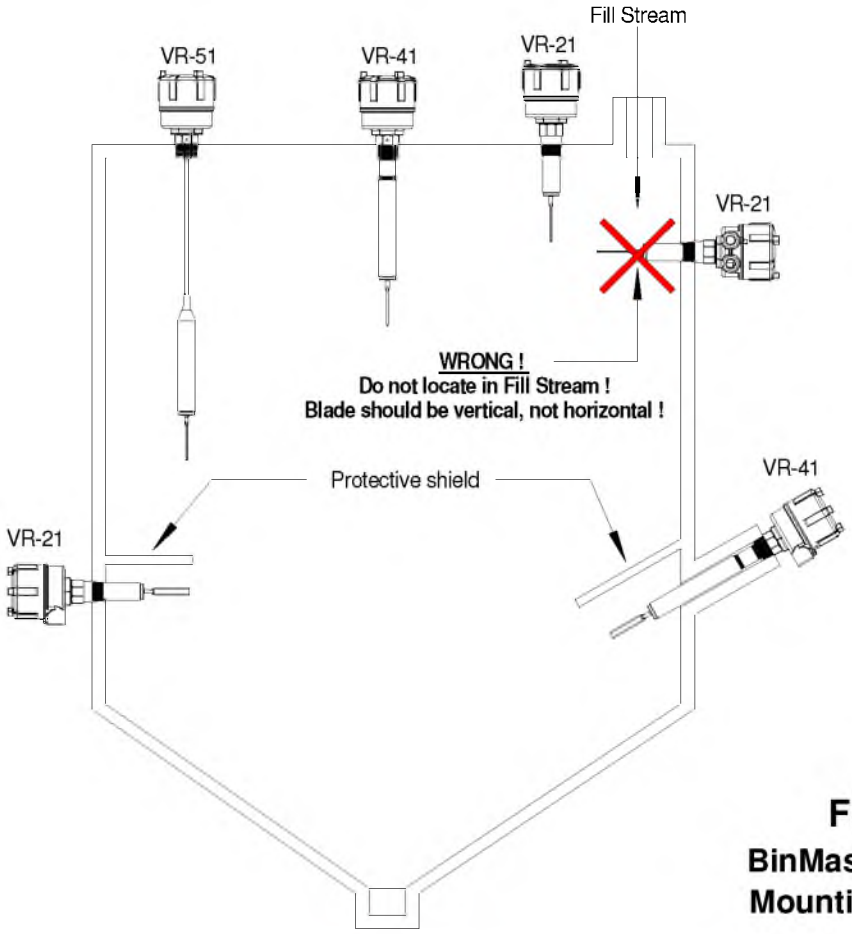
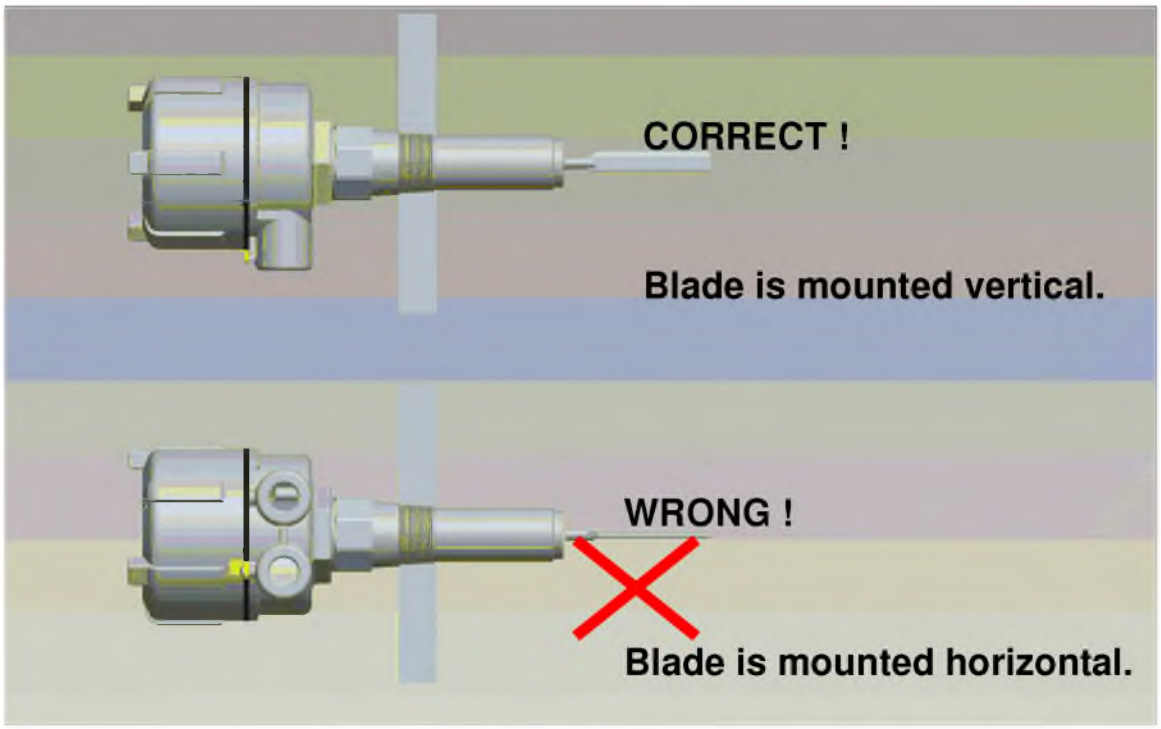


Figure 1
BinMaster VR series
Mounting Locations



The conduit entries must always point downwards to prevent moisture from seeping inside the housing. If the housing is not in the correct position after the probe has been firmly screwed into the bin wall, proceed as follows:

- Remove the cover of the housing.
- Unscrew and remove the 3 mounting screws for the upper circuit board.
- Remove the upper circuit board. Be careful not to bend the interconnect pins on the bottom of the circuit board.
- Unscrew and remove the 3 hex standoffs that secure the lower circuit board.
- Remove the lower circuit board. The wires from the probe do not need to be removed from the circuit board, but care should be taken not to damage the circuit board or wires.
- Use a 10mm wrench or socket to loosen and remove the nut that secures the housing to the vibrating rod assembly.
- Lift off the housing from the vibrating rod assembly. Take care not to damage the wires or the circuit board.
- The housing can be rotated in 90° increments to achieve an orientation that has the conduit entries pointing downward.
- Place the housing back on the vibrating rod assembly so that the tube for the wires is in one of the 4 notches in the housing.
- Replace the flat retaining washer and flat washer and screw the nut back on the stud from the vibrating rod assembly. Firmly tighten the nut.
- Replace the lower circuit board and secure it with the 3 standoffs.
- Replace the upper circuit board. Be sure to align all of the interconnecting pins on the bottom of the upper circuit board and plug the 2 boards together.
- Secure the upper circuit board with the 3 mounting screws.

4.2 Input Power and Field Wiring

The BinMaster VR units have a wide voltage range power capable of being powered from any voltage from 20 volts to 250 volts AC or DC. The terminals on the circuit board for the power supply and the relay contacts allows for a maximum conductor size of 12 AWG. An equipment grounding connection (earth ground) should be supplied to the unit for safety. See the diagram below for terminal and component identification. Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation.

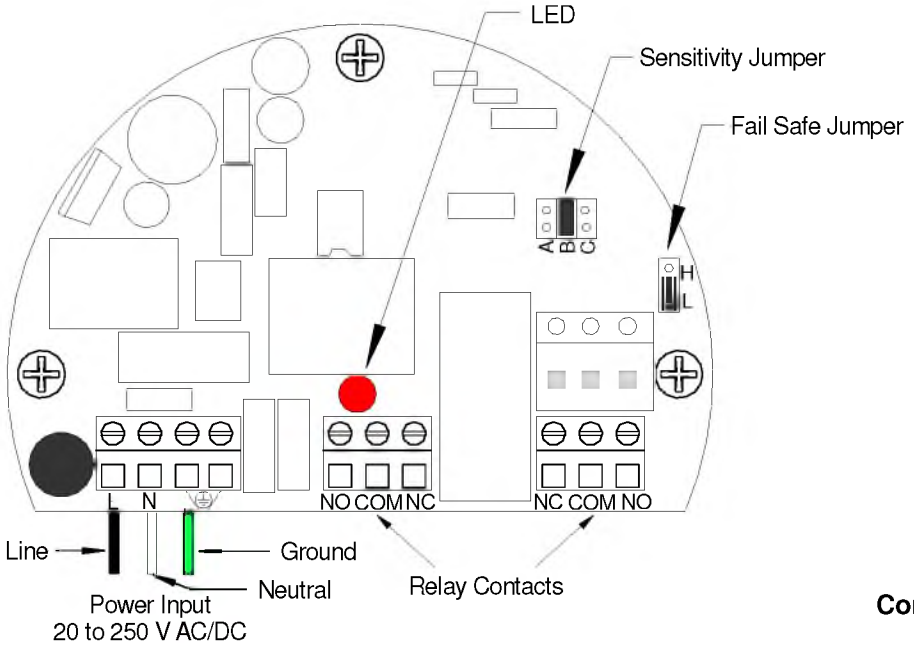


Figure 2
Wiring Terminal & Component Identification

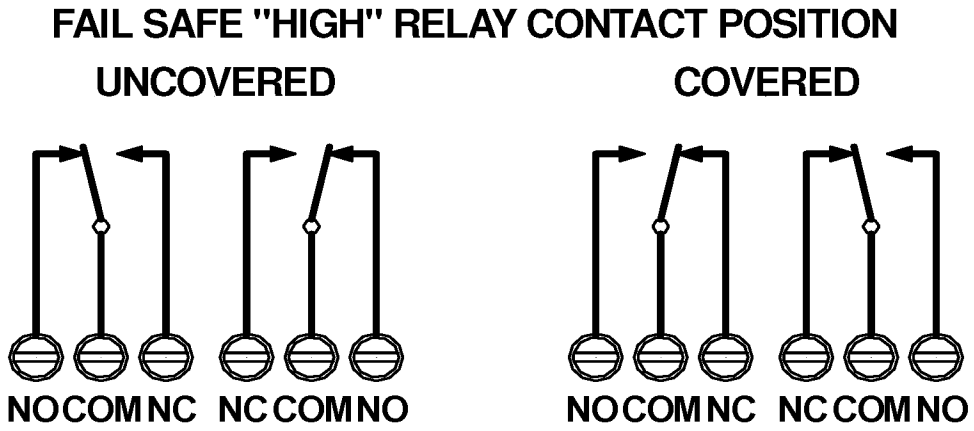
5.0 FAIL-SAFE SELECTION

5.1 Description

A Fail-Safe condition means that the relay contact positions are set up so that in the event of a power failure the relay will be de-energized and the contacts will indicate a condition that is deemed safe for the application. (Refer to Figure 2 for the location of the Fail-Safe selection switch.)

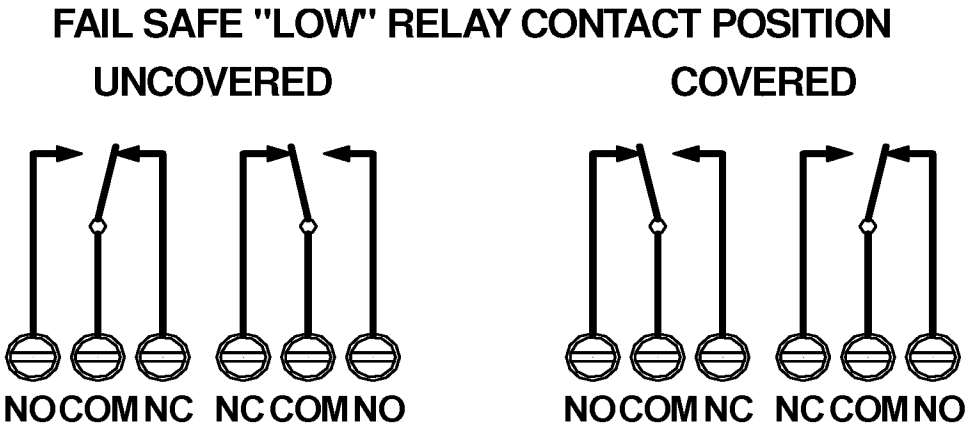
5.2 Fail-Safe High

Fail-Safe High means that the relay will be energized when the probe is uncovered and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is covered whether it is or not.



5.3 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the probe is uncovered and will energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the probe is uncovered whether it is or not.



6.0 Sensitivity Selection

Sensitivity Setting (typical)	Material Characteristics
Pos. A:	Use this setting only for very light material with densities down to 1.25 lb./cu.ft., (20g/l). The sensitivity is very high at this setting.
Pos. B:	Standard setting, sufficient for most materials.
Pos. C:	For heavy materials with high densities which may form a deposit on the vibrating blade. As the sensitivity of the instrument is low at position C, very light material such as expanded styrofoam cannot be detected at this setting!

For special model SEDIMENT VR only B or C must be used, see special instructions for SEDIMENT!

7.0 LED

The LED on the circuit board is a visual indication of the status of the vibrating rod relay. The LED will be flashing when the relay is de-energized and will be ON solid when the relay is energized. The Fail Safe jumper position will determine when the relay is energized.

Fail Safe Setting	V Rod Status	LED Status	Relay Status
L	UNCOVERED	FLASHING	DE-ENERGIZED (COM CONNECTED TO NC)
L	COVERED	ON SOLID	ENERGIZED (COM CONNECTED TO NO)
H	UNCOVERED	ON SOLID	ENERGIZED (COM CONNECTED TO NO)
H	COVERED	FLASHING	DE-ENERGIZED (COM CONNECTED TO NC)

8.0 REMOTE ELECTRONICS INSTALLATION

In some applications such as excessive vibration or ambient temperatures above +140° F, it may be necessary to locate the electronic circuit board away from the vibrating rod. In these applications, a separate remote enclosure is used to mount the circuit board, and a special cable with individually shielded conductors is used to interconnect the circuit board to the vibrating rod unit. The remote electronics option is available for the VR-21, VR-41, and VR-51 vibrating rods.

Figure 6 shows the mounting hole locations for the remote electronics enclosure. The interconnecting cable connections are also shown in Figure 6. The input power is supplied to the remote electronics and the special individually shielded conductor cable is routed between the remote electronics and the vibrating rod. The interconnect cable will have a wire connecting terminal “T” on the remote board to terminal “T” in the vibrating rod; terminal “R” on the remote board to terminal “R” in the vibrating rod; and signal ground on the remote board to signal ground in the vibrating rod.

9.0 WARRANTY AND CUSTOMER SERVICE

9.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.)This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

2.)The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.)This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.)This warranty is in lieu of all other warranties, expressed or implied.

9.2 Customer Service

BinMaster offers a toll-free Customer Service phone number **1-800-278-4241.** You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via **fax** at **(402) 434-9133**.

10.0 DISPOSAL

This product consists of materials that can be recycled by specialized recycling companies. It uses recyclable materials and the electronics are designed to be easily separated. Consult local authorities for proper disposal locations.

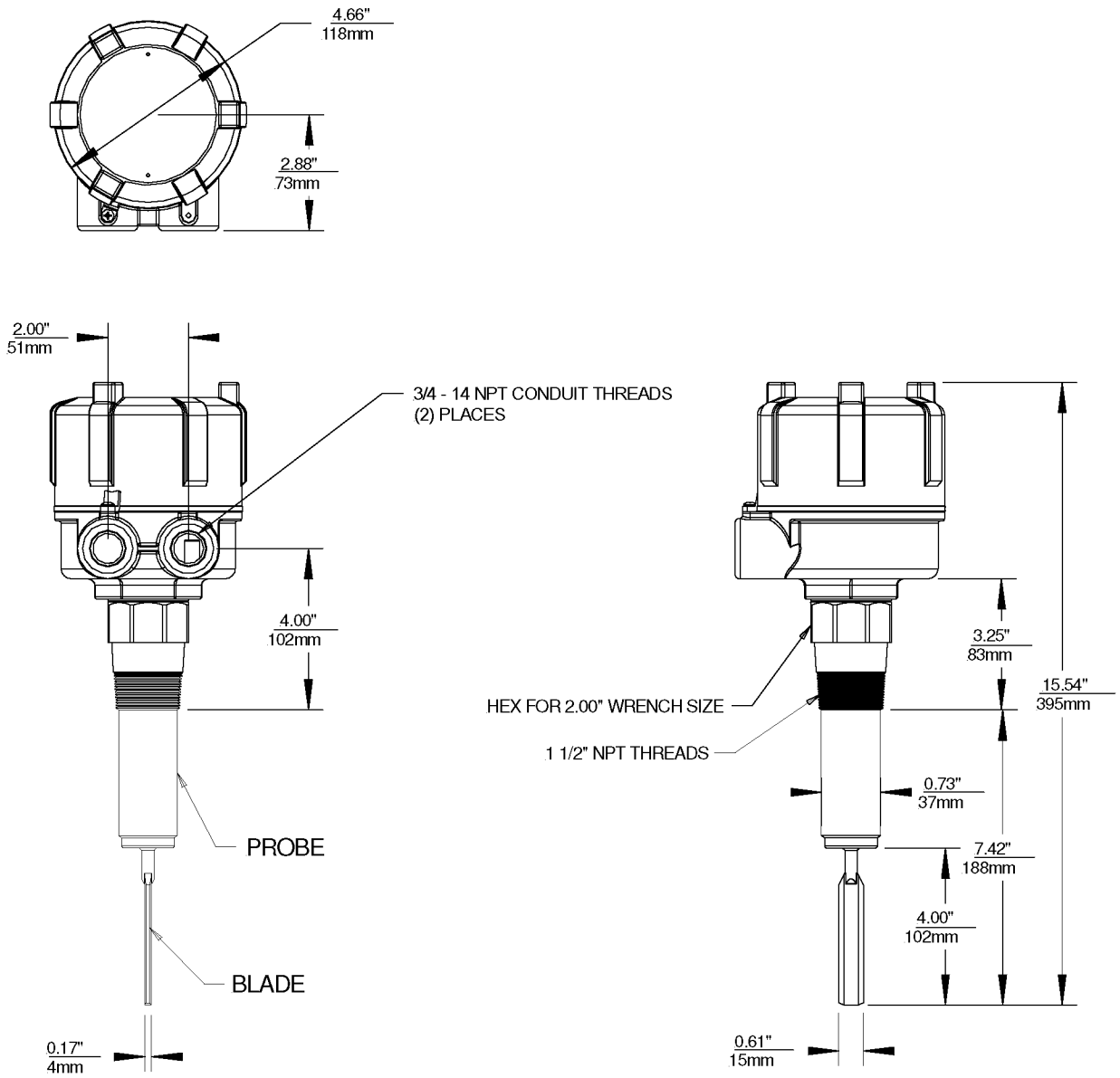


Figure 3

VR-21

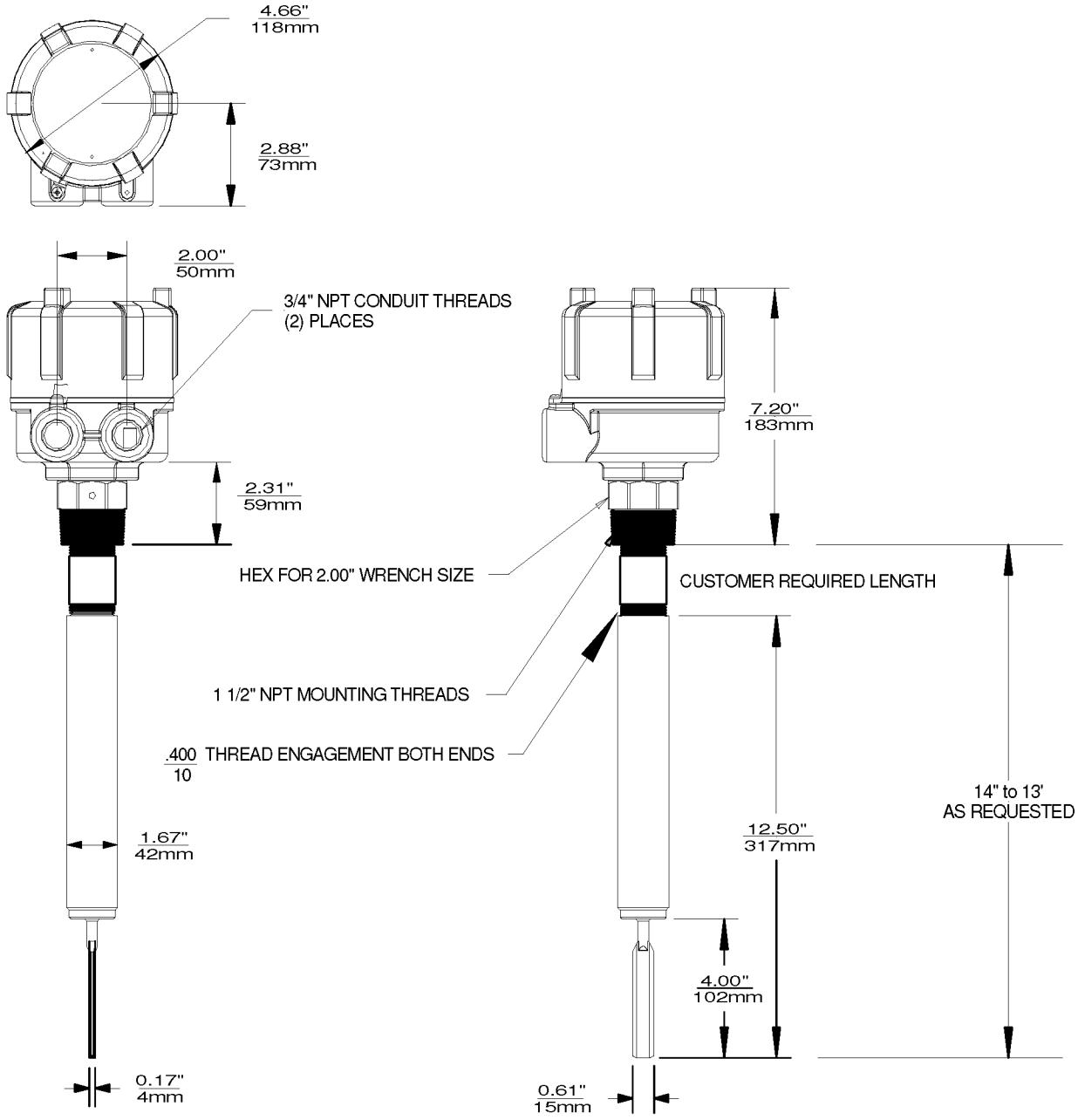


Figure 4 VR-41

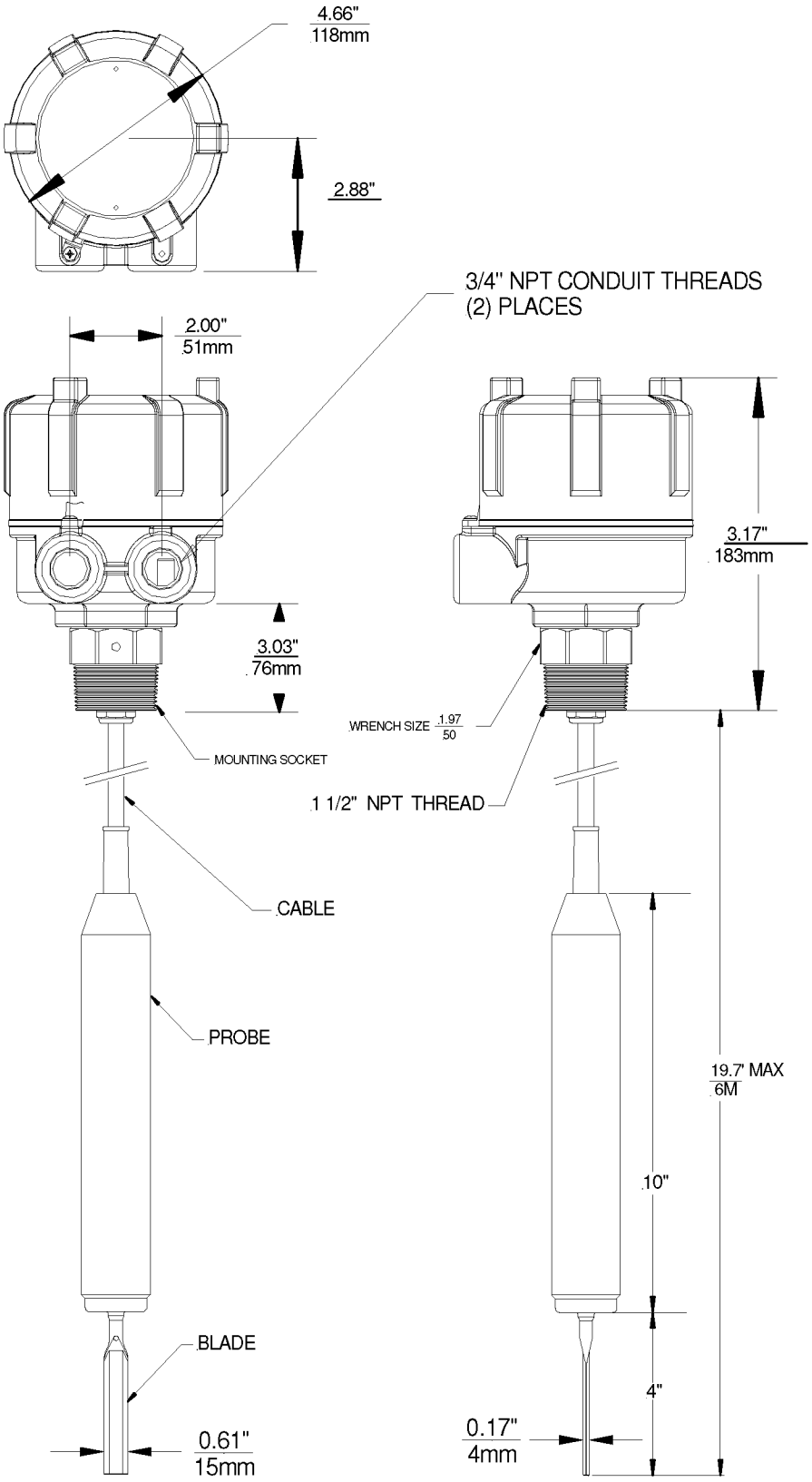


Figure 5 VR-51

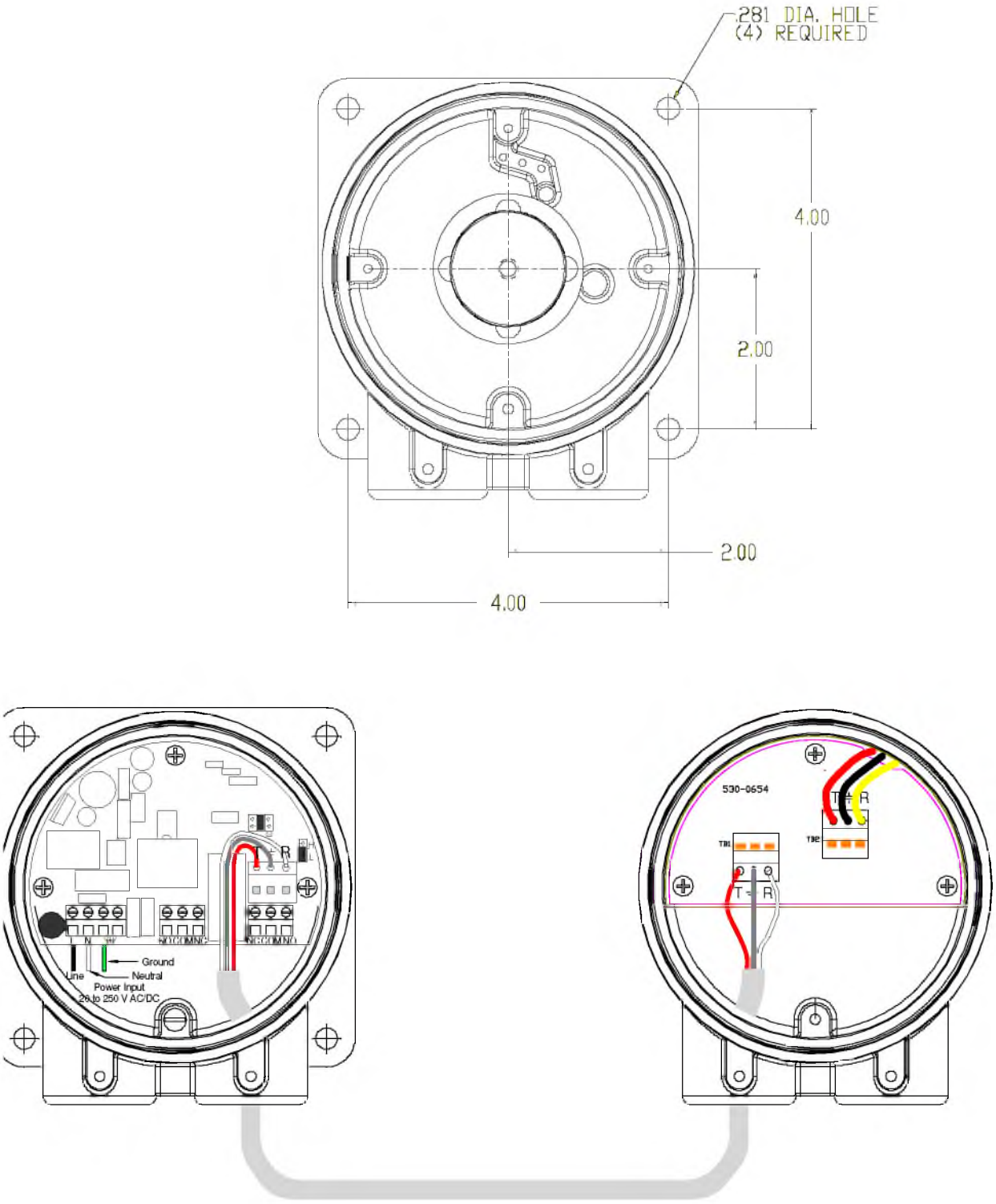


Figure 6
VR Remote Mounting Dimensions and Wiring

Declaration of Conformity

BinMaster declares that the VR series vibrating rod level control devices as listed below comply with the following directives and harmonized standards. This product if installed, operated and maintained as described in this manual will provide a safe and reliable point level control device for bulk solid materials.

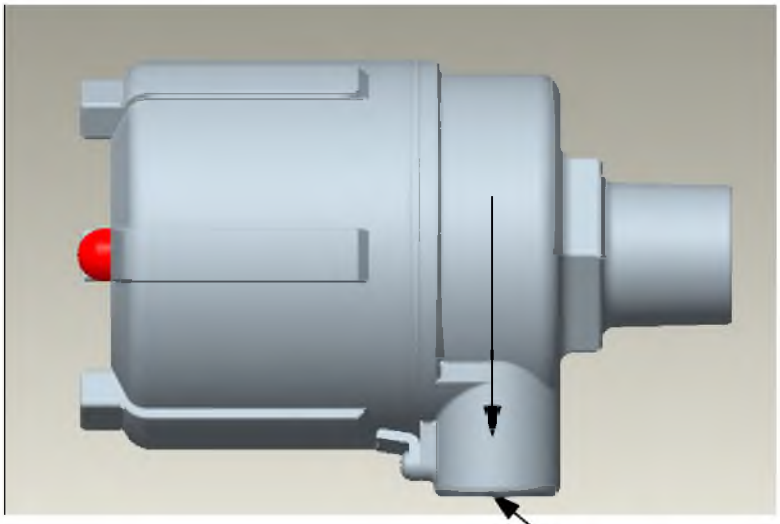
Low Voltage Directive 73/23/EEC
Standard IEC 61010-1:2001

Product: Vibrating rod point level control device.
Models: VR-21, VR-41, and VR-51

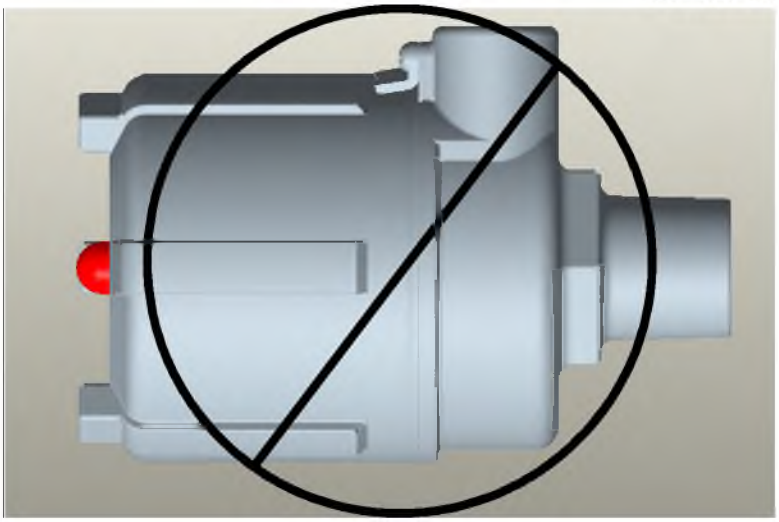
All test reports and documentation are held and can be obtained from BinMaster.

Manufacturing Location: Lincoln, Nebraska, USA

Mounting Instructions



Always Mount Unit With
Conduit opening down



Conduit Seal

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure through the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

BINMASTER®

BM-TSM TILT SWITCH LEVEL CONTROL

BINMASTER®

TABLE OF CONTENTS

SPECIFICATIONS

BM-TSM TILT SWITCH LEVEL CONTROL
GENERAL SPECIFICATIONS

Switch:	SPDT Mechanical Switch, maximum 250 VAC @ 15A
Enclosure:	NEMA 4X, 5, & 12; IP 66
Mounting:	1-1/4" NPT
⚠ **Conduit Entry:**	3/4" NPT
Enclosure:	Die Cast Aluminum, USDA approved powder coat finish
Available Rod Lengths:	¼" Pipe (SS or Galv.): 1 foot (30.48cm) to 8 feet (243.84cm) 3/8" SS Round: 1 foot (30.48cm) to 8 feet (243.84cm)

SAFETY

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all National and Local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the device.

Properly ground the enclosure to an adequate earth ground.

Observe all switch contact ratings as called out on the nameplate and in the installation manual.

Insure that the enclosure cover is in place and secured tightly during normal operation.

In potentially wet environments thoroughly seal all conduit entries.

If this product is used in a manner not specified by the manufacturer the safety protection could be compromised.

Safety Terms and Symbols

⚠ **WARNING:** Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

⚠ **CAUTION:** Caution statements identify conditions or practices that could result in damage to this product or other property.

Safety Precaution

⚠ **CAUTION:** Before removing the enclosure cover, open all circuits entering the enclosure. Be aware that there may be more than one live circuit.

INTRODUCTION

1.0 INTRODUCTION

The Bin-Master tilt switch Model BM-TSM is mercury-free, simple and affordable level control designed to control the maximum fill level of bulk solids, such as powder, pellet, and granular materials.

The BM-TSM tilt switch features a non-powered, pendulum-type design for fixed mounting on the outside on the top of the bin. It operates by utilizing an angular motion transferred into linear motion to activate an electrical switch that can be used for a direct input to a control system, or activate an external alarm. The switch is activated when material rises to the level of the probe and tilts the switching mechanism 15 degrees from the vertical hanging position in any direction.

The extension shaft of the tilt switch varies in lengths from one foot up to eight feet in length. You specify the length of the shaft based upon the distance from the top of the bin an alert should be activated. The BM-TSM is available with either a paddle or sphere mounted at the end of the shaft and can be used in materials with a bulk density of at least 15 pounds per cubic foot.

2.0 INSTALLATION

2.1 Location and Mounting
Top Mount – Permanent Installation

1. Locate and cut a hole in top of bin to accept an outside diameter of 1-1/4" pipe coupling (1.950").
2. Position coupling halfway into bin opening and weld.
3. Install tilt switch into the 1-1/4" NPT coupling and tighten unit so conduit opening is in the desired location.
4. Thread on either the ¼" NPT pipe or 3/8" round with either the paddle or sphere into the flexible coupler and secure with provided roll pin.

Steps 3 and 4 can be reversed if a collapsible indicator paddle is purchased that will fit through the 1-1/4" NPT opening. This will avoid possible entry into vessel to install extension assembly.

NOTE: It is strongly recommended that a thread sealer or pipe dope be used on the 1-1/4" NPT mount and ¾" conduit connections prior to installation.

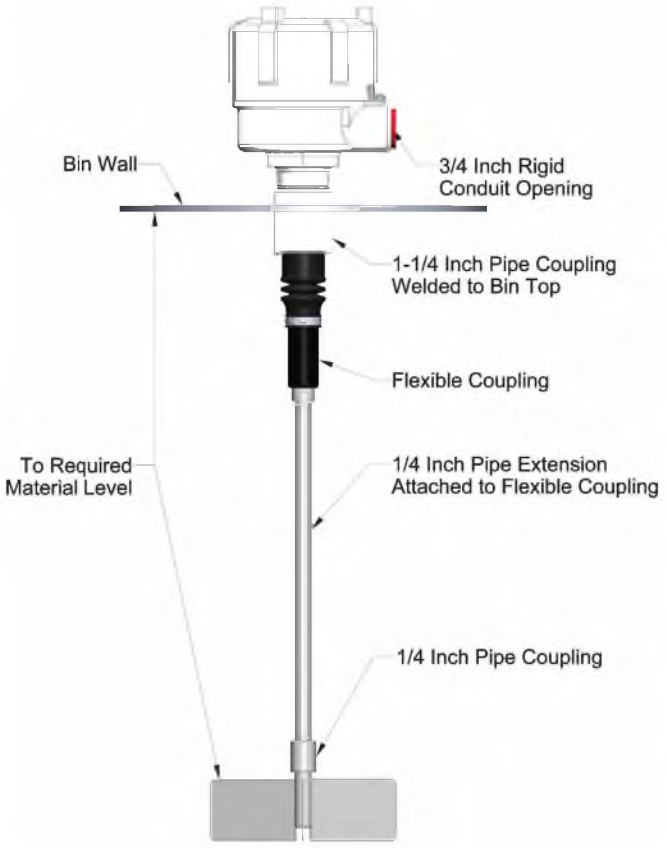


Figure 1

Top Mount – Semi-Permanent Installation

Mounting plates are necessary when a completely assembled unit is to be mounted on the bin top from the outside when bin access is limited or not permitted, (Fig. 2 & 3, pg.6). First a 5-1/2" hole is cut in the bin top. Next, six bolt holes are drilled around the hole to match the mounting plate, (drill templates are shipped with each mounting plate). The plate, with the unit attached, is then bolted in place. All mounting plates are available in either powder coated carbon steel or un-coated stainless steel.

Full Coupling

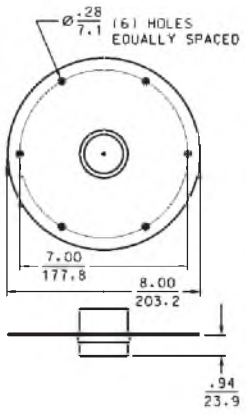


Figure 2

Half Coupling

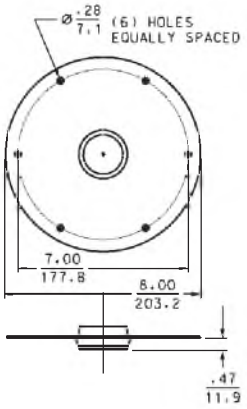


Figure 3

TOP MOUNT ONLY

Side mounting for the BM-TSM level control is not recommended.

2.2 Field Wiring

⚠ Access the switch by removing the electrical enclosure cap. (Do not remove or loosen the switch from its bracket, as it has been factory adjusted). Wire directly to the switch's terminals as illustrated, (Fig. 4 & Fig. 5, pg. 6). In the vertical position, the switch is not-engaged, the NORM CLOSED contact is closed and the NORM OPEN contact is open. When tilted, the micro switch is engaged, the NORM CLOSED contact is open and the NORM OPEN contact is closed.

Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation. Use wire that is sized and rated for the maximum voltage and current as per application, up to 250VAC 15A, and has a temperature rating of at least 70°C. Installation shall be done by qualified personnel.

Figure 4

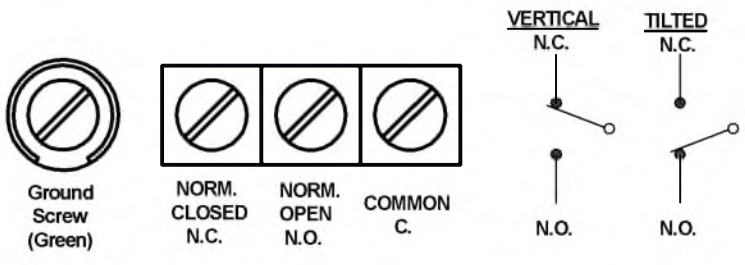


Figure 5

2.3 Grounding

⚠ An equipment grounding connection (earth ground) must be supplied to the unit for safety. Connect the ground conductor to the green equipment grounding screw identified in the enclosure, (Fig. 4, pg. 6).

3.0 WARRANTY AND CUSTOMER SERVICE

3.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.) This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied.

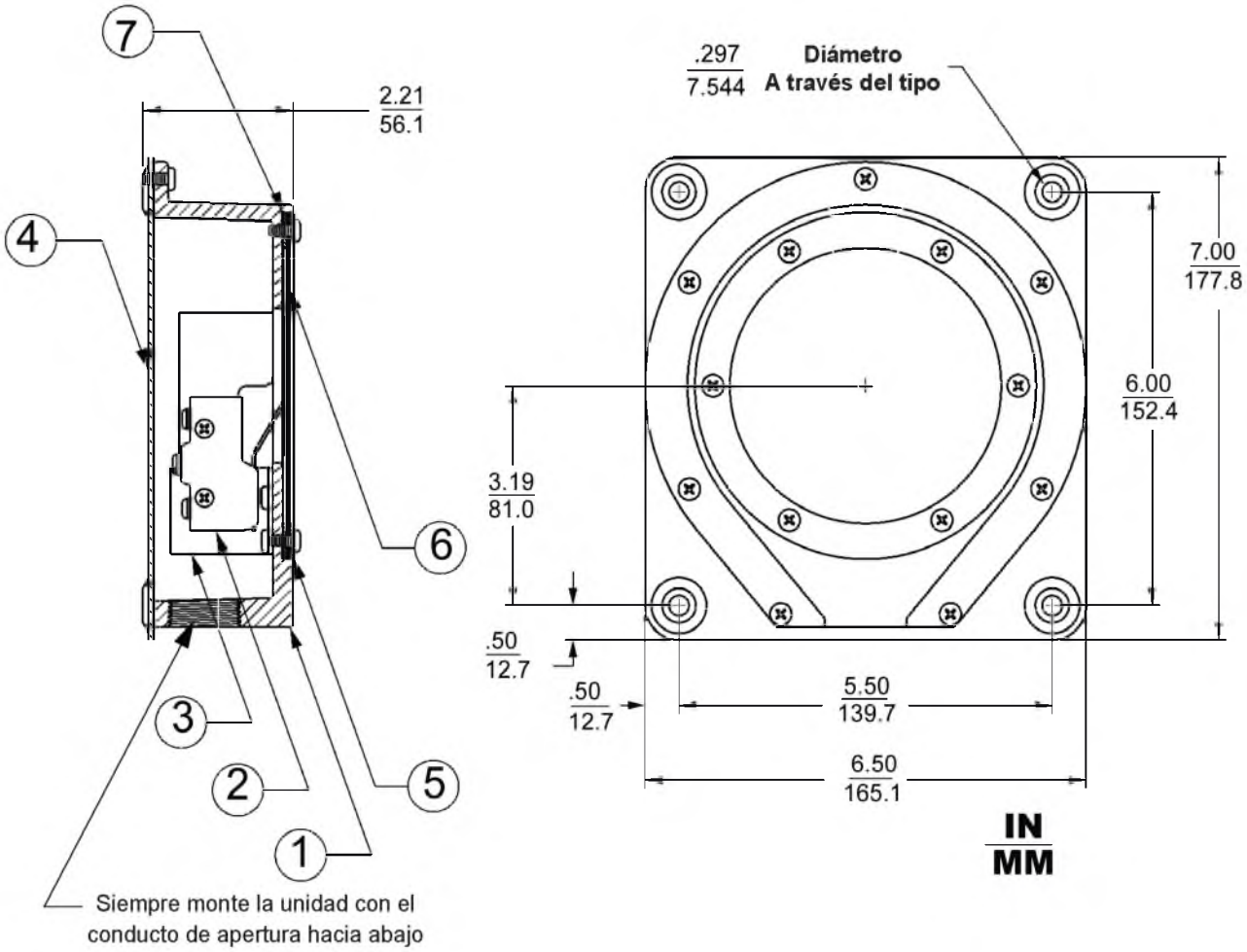
4.0 DISPOSAL

This product consists of materials that can be recycled by specialized recycling companies. It uses recyclable materials are designed to be easily separated. Consult local authorities for proper disposal locations.

Diaphragm Switch
BM45

BM45 R, RH, RHT

Diafragma con Propósito General



Item	Part No.	Descripción
1	220-0021	Recinto de Aluminio Fundido
2	530-0016 530-0042	Conjunto de Micro Interruptor BM45 R) Conjunto de Micro Interruptor BM45 RH, RHT)
3	205-0024	Soporte de Montaje Micro Interruptor
4	270-0023	Placa de Montaje Trasera
5	275-0010	Diafragma Anillo de Retención
6	225-0003 225-0004 225-0005	Diafragma de Neopreno (BM45 R) Diafragma de Neopreno Pesado (R45 RH) Diafragma de Silicona (BM45 RHT)
7	280-0004	Anillo de Empaque

Instrucciones de instalación de la serie BM45

Opciones de instalación

NOTA: El montaje vertical es necesario para un funcionamiento correcto.

Instalar serie **BM45F** en la parte exterior de la pared del contenedor. La unidad se debe montar en posición vertical con el diafragma¬ orientado hacia el centro del contenedor. Antes del montaje, determinar la ubicación deseada de la unidad y, a continuación, corte un hoyo de cinco pulgadas en el lado del contenedor. No deforman o doble la placa de montaje al atornillar a la pared del contenedor. Use un suplemento de embalaje a la unidad si se efectúa el montaje en una superficie desigual.

El **BM45R** serie se monta en el interior del contenedor, con el diafragma hacia el centro del contenedor. Fijar con cuatro tornillos.

NOTA: Al instalar el BM 45 en lugares donde la humedad o aire húmedo podría entrar a través del recinto los conductos eléctricos, use un sello del conducto compuesto para sellar la apertura de conducto.

Refiérase a los dibujos de la próxima página para las dimensiones de los agujeros de montaje para las unidades BM45F ó BM45R.

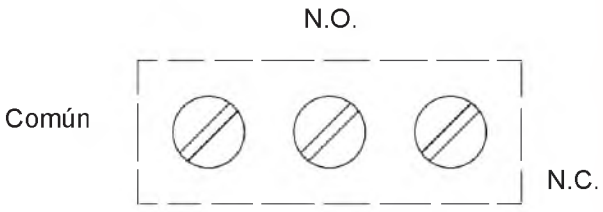
Instrucciones de Cableado

La cubierta BinMaster tiene disposiciones para la conexión a un conducto de 1/2 pulgada.

Retire la placa trasera de la BM45. Esto expondrá el snap-interruptor unipolar de doble tiro. El interruptor está clasificado: 15A @ 125VAC, 1OA @ 250VAC, 1/8 HP-125VAC, 1/4 HP-250VAC, 1/2A @ 125VDC.

Hay tres terminales del interruptor: “Común”, “Normalmente Abierto”, y “Normalmente Cerrada”. La condición¬ a que se refiere como “Normal” es con ningún material que cubre el diafragma de la BM45

Consulte los dibujos en la siguiente página de dimensiones del hoyo de montaje para ya sea las unidades de la serie BM45F o serie BM45R.



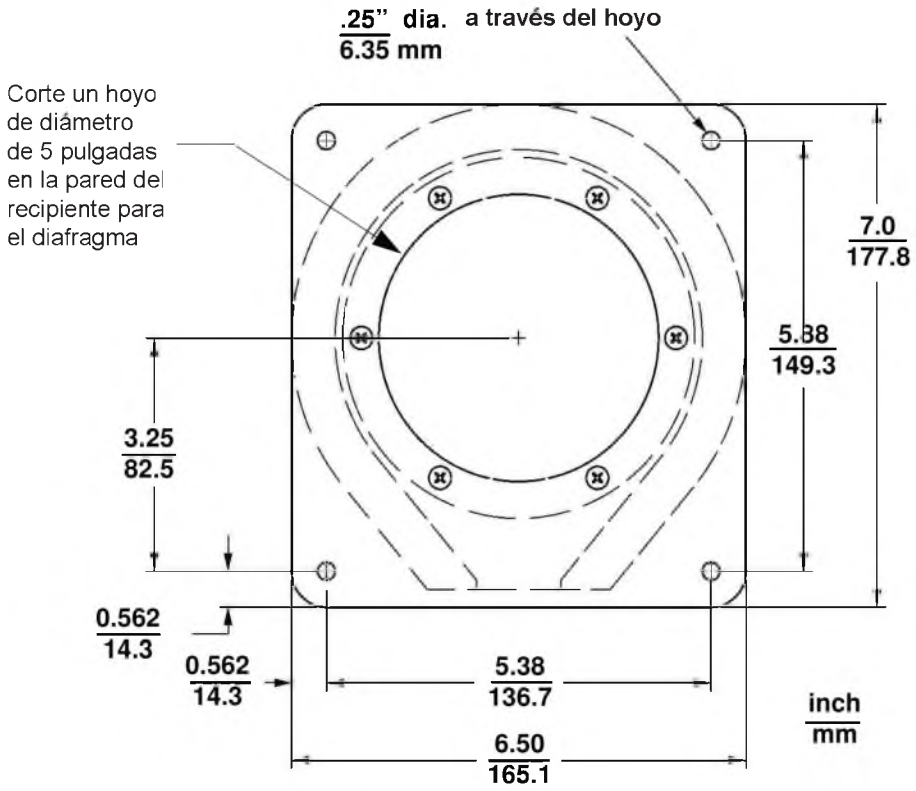
Ejemplos:

A. El interruptor de BinMaster se puede utilizar para controlar un relé de arranque del motor. Para cablear o conectar el interruptor de BinMaster de parada o detener el motor cuando el material cubre el diafragma, utiliza los terminales del interruptor “Común” y “Normalmente Cerrado”.

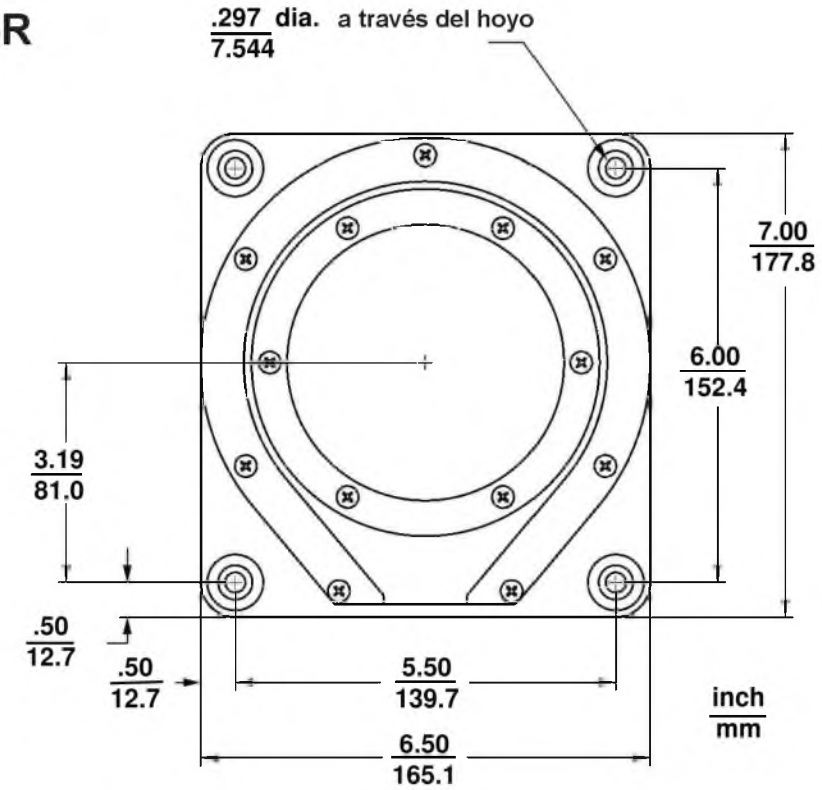
B. Para conectar el interruptor BinMaster para encender una luz, o activar una señal de alarma cuando el material cubre el diafragma, utilizar “Común” y “Normalmente Abierto”.

Advertencia de Seguridad: el BM45 no está aprobado para su uso en polvo de combustible. Utilize la Serie BM65 para tales aplicaciones.

Serie BM45F



Serie BM45R



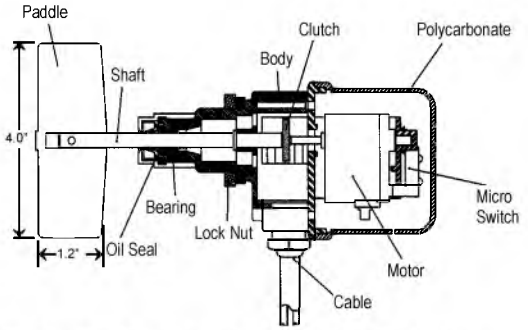
Mini-Rotary

Compact Rotary Control For Dry Solids

Specifications

Input Voltage: 110/230/24 VAC 50/60 Hz
Power Consumption: 1.5 Watts
Switch: SPDT
Contact Rating: 3A @ 250 VAC
Rotary Speed: 1 RPM
Temperature Range: -4° F to +140° F
Wiring Cable: 18 AWG, 12 inch cable
Mounting: 3/4" PF
Clutch: Magnetic Slip Clutch prevents damage to motor gears
Enclosure: Polycarbonate, NEMA 1
Weight: .77 lb.

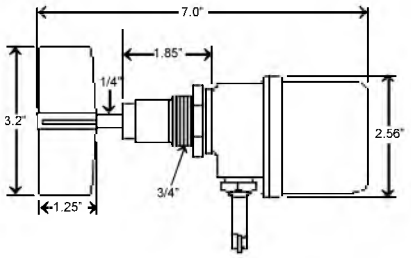
Mini-Rotary Structure



*Unit shown with Optional 304 Stainless Steel Rectangular Paddle

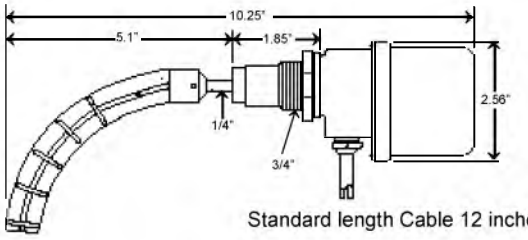
Dimensions

Mini-Rotary with 4-Vane Polycarbonate Paddle

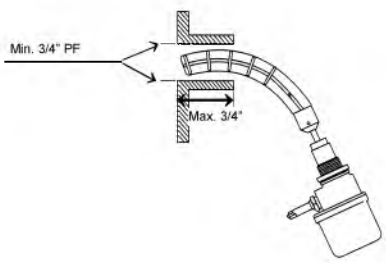


Standard length Cable 12 inches

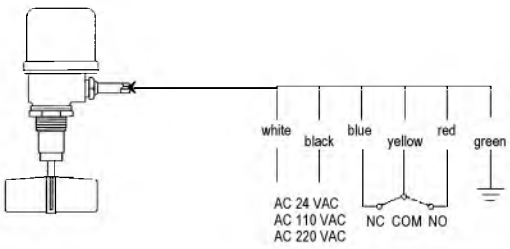
Mini-Rotary with Bayonet Insertable Polycarbonate Paddle



Standard length Cable 12 inches



Wiring Diagram



INSTALLATION AND OPERATING INSTRUCTIONS:

1. The conduit opening should be placed in a downward position to protect from moisture entering the unit through the conduit.
2. When installing or performing maintenance in the field, be sure that all power is de-energized.
3. The operating temperature in the tank or bin should be within the temperature rating of this product.
4. When selecting a mounting location, be sure the material can freely flow to and away from the shaft and paddle.
5. The shaft and paddle should also be out of the direct flow of material as it fills the bin or tank.
6. If mounted in the flow stream, a protective baffle should be installed on the inner wall of the bin or tank.
7. When internal access is available on the bin, first remove paddle and insert shaft through 3/4" PF connection on bin wall and reattach paddle to shaft with cotter pin.

TROUBLESHOOTING GUIDE

CONDITION	POSSIBLE CAUSE	SOLUTION
Paddle keeps rotating when covered with material	Paddle size is not suitable for use in existing material due to the material density	Replace with correct paddle size
Paddle out of shape or shaft is bent	The impacting force of material is too great	Relocate paddle and shaft out of Fill stream or provide a protective baffle to protect the paddle and shaft.
No rotation of paddle	1) No power to unit 2) Motor damaged	1) Check the wire connects 2) Replace the motor

BMRX Series
Rotary Level Indicator

TABLE OF CONTENTS

SPECIFICATIONS

BMRX GENERAL SPECIFICATIONS

Supply:	**AC MODELS**	24 VAC, 115 VAC, or 230 VAC 50/60 Hz
	DC MODELS	12 VDC or 24 VDC
Supply Tolerance:		-15% +10%
Load:		AC Model = 5.5 VA; DC Models = 1 VA
Ambient Temperature: (Electronics)		-40°F to +158°F (-40°C to +70°C)
Enclosure:		Type 4X, 5, 7, 9, & 12 (Hazardous Location Class I, Groups C & D / Class II, Groups E, F & G)
DPDT Relay Output:		10 Amps 250 VAC
Fail-Safe:		Switch selectable “High” or “Low” level modes
Mounting:		1-1/4” NPT
Conduit Entry:		3/4” NPT
Shaft Seal:		1/2 micron, 30 PSI
Enclosure:		Die cast aluminum, FDA recognized powder coat finish

SAFETY

SAFETY SUMMARY

Review the following safety precautions to avoid injury and prevent damage to the equipment.

The product should be installed, commissioned, and maintained by qualified and authorized personnel only.

Install according to installation instructions and comply with all National and Local codes.

Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Properly ground the enclosure to an adequate earth ground.

Observe all terminal and relay contact ratings as called out on the nameplate and in the installation manual.

Ensure that the enclosure cover is in place and secured tightly during normal operation.

In potentially wet environments thoroughly seal all conduit entries.

If this product is used in a manner not specified by the manufacturer, the safety protection could be compromised.

Safety Terms and Symbols

⚠ **WARNING:** Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock.

⚠ **CAUTION:** Caution statements identify conditions or practices that could result in damage to this product or other property.

INTRODUCTION

1.0 INTRODUCTION

The BinMaster BMRX is a rotating paddle style level sensor which provides reliable point level detection for bulk solids, including powder, pellet, and granular materials. The unit has a switch selectable fail-safe relay that will fall to a "safe" condition in the event of a power failure.

The BMRX motor rotates the drive shaft and paddle at 1 RPM (2 RPM on 24 VDC Model). When the vessel material fills to the level of the indicator paddle, the material causes the paddle to stop rotating indicating a covered condition. When the material falls away, the paddle starts rotating again to indicate an uncovered condition.

2.0 INSTALLATION

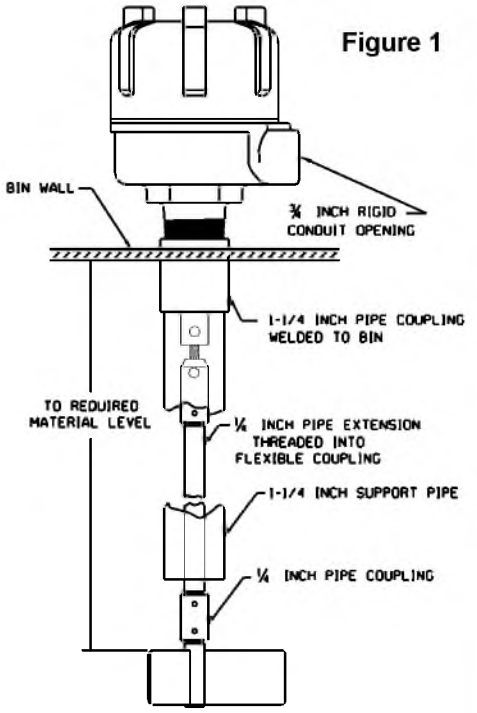
2.1 Location and Mounting

TOP MOUNT

(For mounting plate options see Figure 4 on page 6)

1. Locate and cut hole in top of bin to fit outside diameter of 1-1/4" pipe coupling (1.950").
2. Position coupling halfway into bin and weld.
3. Turn unit so conduit opening is in desired location.
4. Add 1/4" extension pipe to desired length with standard 1/4" coupling on bottom end.
5. Cut 1-1 /4" support pipe approximately 4" shorter than overall length of 1/4" pipe shaft when used with flexible coupling.
6. Insert 1-1/4" pipe into coupling and tighten.
7. Insert paddle into 1/4" coupling and drill holes for lock pins.

Figure 1

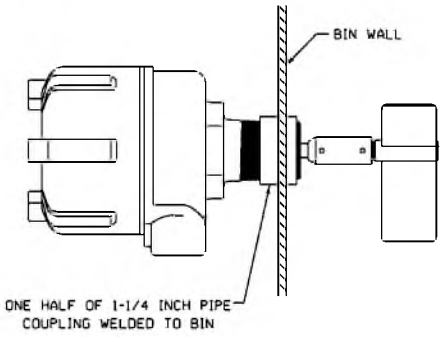


SIDE MOUNT

(For mounting plate options see Figure 5 on page 6)

1. Locate and cut hole in side of bin to fit outside diameter of 1-1/4" pipe coupling.
2. Weld on half of standard 1-1/4" pipe coupling to bin wall flush with inside of bin.
3. Insert hub into coupling and turn until conduit opening is in blown position.
4. Screw paddle into place and replace lock pin.
5. Shaft and paddle should be shielded in low level mounting when subjected to material flow.
6. For side mount, a solid coupler is recommended.

Figure 2



MOUNTING PLATES

Mounting plates are necessary when a completely assembled unit is to be mounted on the bin wall from the outside. A 5-1/2" hole is cut in the bin. Six bolt holes are drilled around the hole to match the mounting plate. The plate, with the unit attached, is then bolted in place. All mounting plates are available in carbon and stainless steel.

For use with all rotary level controls. This model is used for top of bin installations where shaft extensions and shaft guards are required.

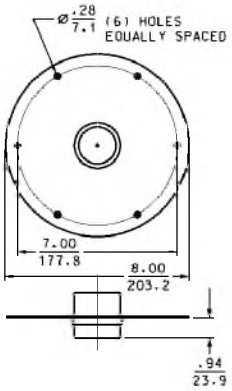


Figure 4

Full Coupling Mounting Plate

For use with all rotary level controls. This model is used primarily for side of bin installations.

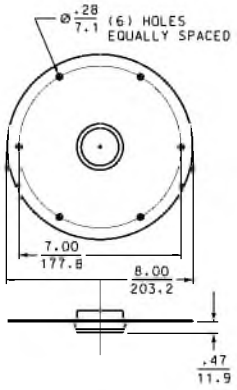


Figure 5

Half Coupling Mounting Plate

BMRX Wiring

2.2 Input Power and Field Wiring

⚠ The BMRX is available in AC and DC Models. The AC Models are available to be powered from 24 VAC, 115 VAC, or 230 VAC 50/60 Hz supply voltages. The DC Models are available to be powered from 12 VDC or 24 VDC supply voltages. See the voltage rating on the nameplate for the appropriate supply voltage. Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation. For power input, use wire that is sized and rated for the maximum voltage and current as per equipment ratings and has a temperature rating of at least 70°C. For relay outputs, use wire that is sized and rated for the maximum voltage and current as per application, up to 250 VAC 10A, and has a temperature rating of at least 70°C. Installation shall be done by qualified personnel.

⚠ Input Power

Power input to the BMRX is connected to the LINE terminals labelled L and N.

AC Models

On AC models if one of the conductors is grounded, it should be connected to the N terminals. The ungrounded conductor should be connected to the L terminal. If neither conductor is grounded then one of them is connected to the N terminal and the other to the L terminal.

⚠ DC Models

On DC models the negative conductor should be connected to the N terminal and the positive conductor should be connected to the L terminal.

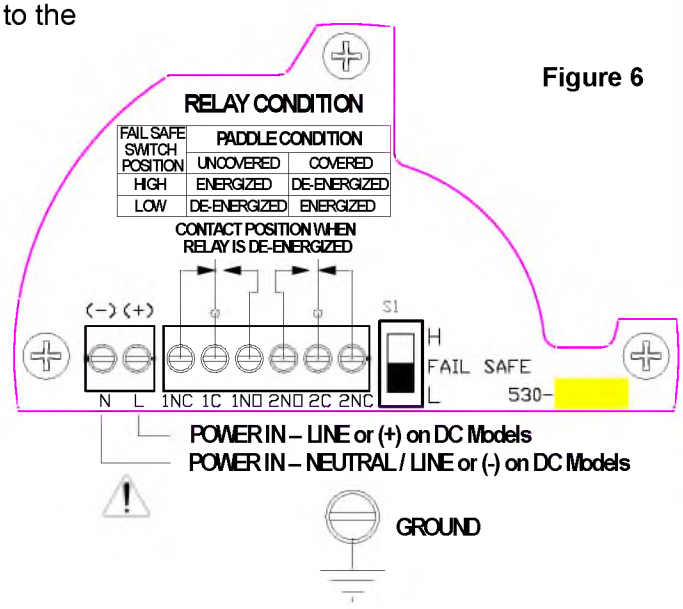


Figure 6

2.3 Grounding

⚠ An equipment grounding connection (earth ground) must be supplied to the unit for safety. Connect the ground conductor to the green equipment grounding screw identified in the enclosure.

3.0 DPDT RELAY

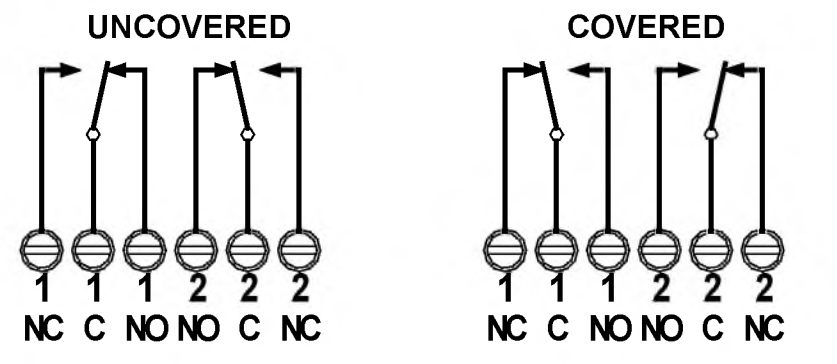
The DPDT relay utilizes a Fail-Safe selector switch. There are 2 positions for this switch, High (H) and Low (L). A Fail-Safe condition means that the DPDT relay contact positions are set up so that in the event of a power failure the relay will be de-energized and the contacts will indicate a condition that is deemed safe for the application.

3.1 Fail-Safe High

Fail-Safe High means that the relay will be energized when the paddle is rotating (uncovered) and will de-energize when the probe is covered. In this mode, a power failure will cause the relay contacts to indicate that the paddle is covered, whether it is or not.

Figure 7

FAIL-SAFE "HIGH" RELAY CONTACT POSITION

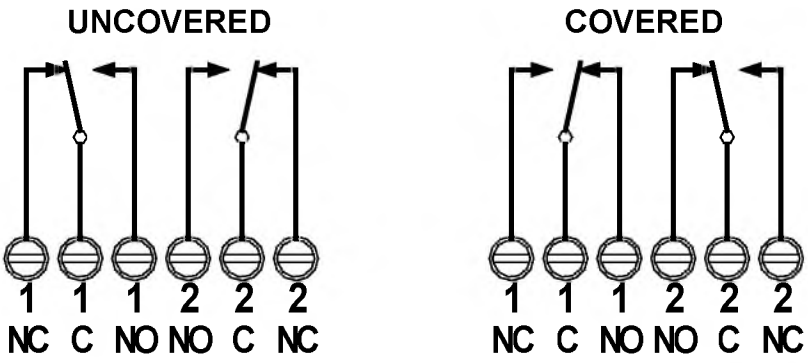


3.2 Fail-Safe Low

Fail-Safe Low means that the relay will be de-energized when the paddle is rotating (uncovered) and will energize when the paddle is covered. In this mode, a power failure will cause the relay contacts to indicate that the paddle is uncovered whether it is or not.

Figure 8

FAIL-SAFE "LOW" RELAY CONTACT POSITION



4.0 WARRANTY AND CUSTOMER SERVICE

4.1 Limited Warranty

The manufacturer warrants this equipment for two (2) years according to the following terms:

1. This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

2. The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid, to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3. This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4. This warranty is in lieu of all other warranties, expressed or implied.

4.2 Customer Service

BinMaster offers a toll-free Customer Service phone number **1-800-278-4241.** You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00 AM to 5:00 PM Central Time. International customers call us at **(402) 434-9102** or reach us via fax at **(402) 434-9133.**

5.0 DISPOSAL

This product consists of materials that can be recycled by specialized recycling companies. It uses recyclable materials and the electronics are designed to be easily separated. Consult local authorities for proper disposal locations.

Declaration of Conformity

BinMaster declares that all models of the BMRX level control devices as listed below comply with the following directives and harmonized standards. This product if installed, operated and maintained as described in this manual will provide a safe and reliable point level control device for bulk solid materials.

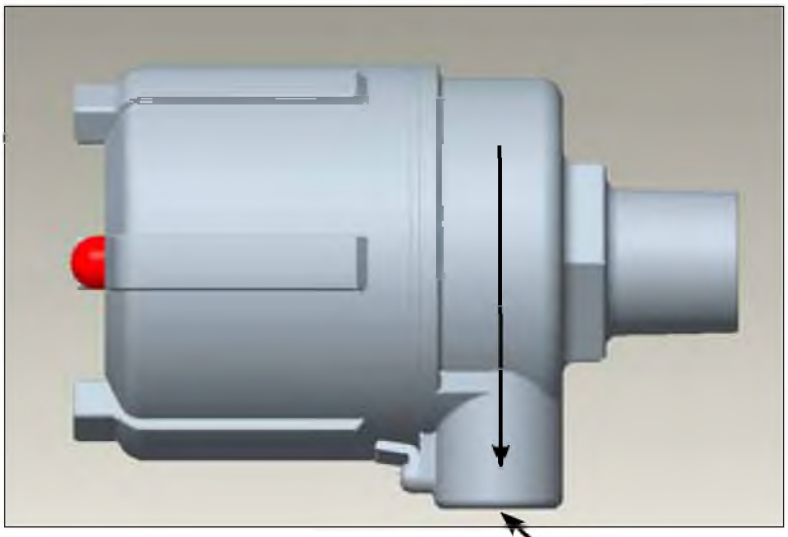
Low Voltage Directive 73/23/EEC
Standard IEC 61010-1:2001

Product: Rotary point level control device
Models: BMRX AC Models 24 VAC, 115 VAC, and 230 VAC; DC Models 12 VDC and 24 VDC

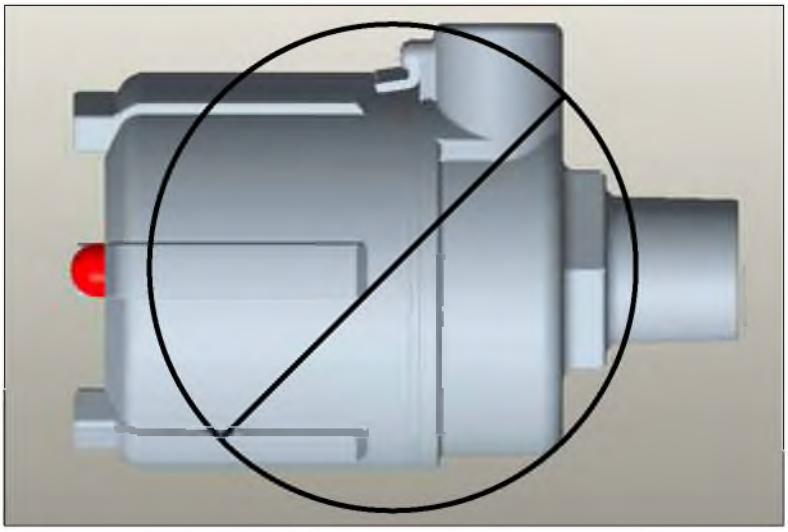
All test reports and documentation are held and can be obtained from BinMaster.

Manufacturing Location: Lincoln, Nebraska, USA

Mounting Instructions



Always mount unit with conduit opening down



Conduit Seal

When installing this level indicator in environments where it is possible for moisture or moist air to enter the enclosure through the electrical conduit, the conduit opening should be sealed with a duct seal compound or putty appropriate for the purpose.

Airbrator – The Air Pad with Both Aeration and Vibration

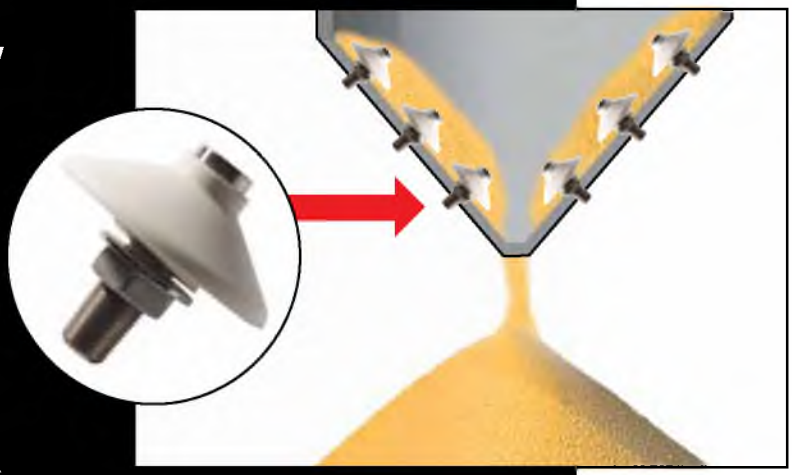
Using a combination of both aeration and vibration, the Airbrator helps solve some of the most difficult material flow applications. Its special design creates a vibration as the air flows between the Airbrator pad's boot and the bin wall. Appropriate for use in any type of bin or silo, the Airbrator is extremely economical, quite easy to install, offers durable construction and is self-cleaning.

Solves Material Flow Problems in Bins and Silos

The Airbrator is a very effective flow aid for many types of dry materials such as flyash, cement, flour, lime, sands and salt – as well as many other difficult granular or powder bulk solid materials – and can even be used with abrasive materials. Airbrator features a stainless steel shaft and can be used in food-grade applications. As an added benefit, Airbrator pads do not require a specific air pressure for operation. It can use high or low pressure blower air from as low as 5 PSIG to as high as 60 PSIG.

Airbrator Features

- Vibratory action promotes material flow
- Can be used in any type of silo or bin
- Affordable and economical
- Stainless steel shaft
- Easy to install
- Self-cleaning
- Built-in check valve
- Durable construction
- Rated up to 400° F
- Uses low or high pressure air
- Suitable for abrasive materials
- For granular or powdered materials
- Appropriate for food grade applications

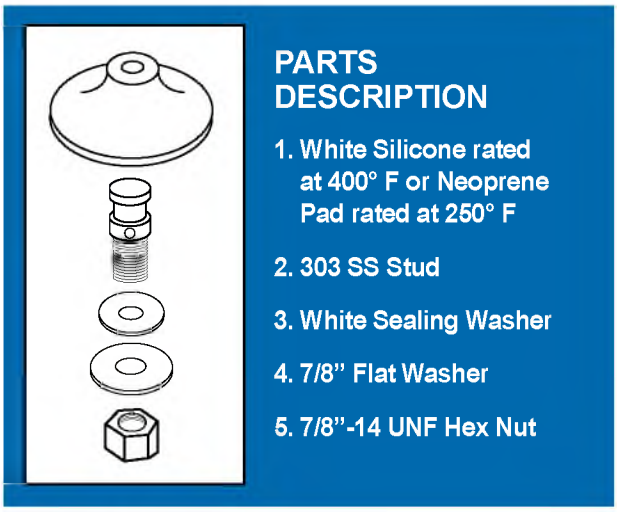


Airbrator Air Pad

BINMASTER®

Airbrator Solves Flow Problems

The Airbrator air pad is designed to help dry granular and powdered bulk material that tends to hang up or bridge to consistently flow from silos and bins. Multiple Airbrators can be installed at strategic locations inside the lower cone of the bin along areas where material tends to stick or bridge. By combining both aeration and vibration, the Airbrator can resolve some of the more difficult material flow applications that aeration alone cannot.

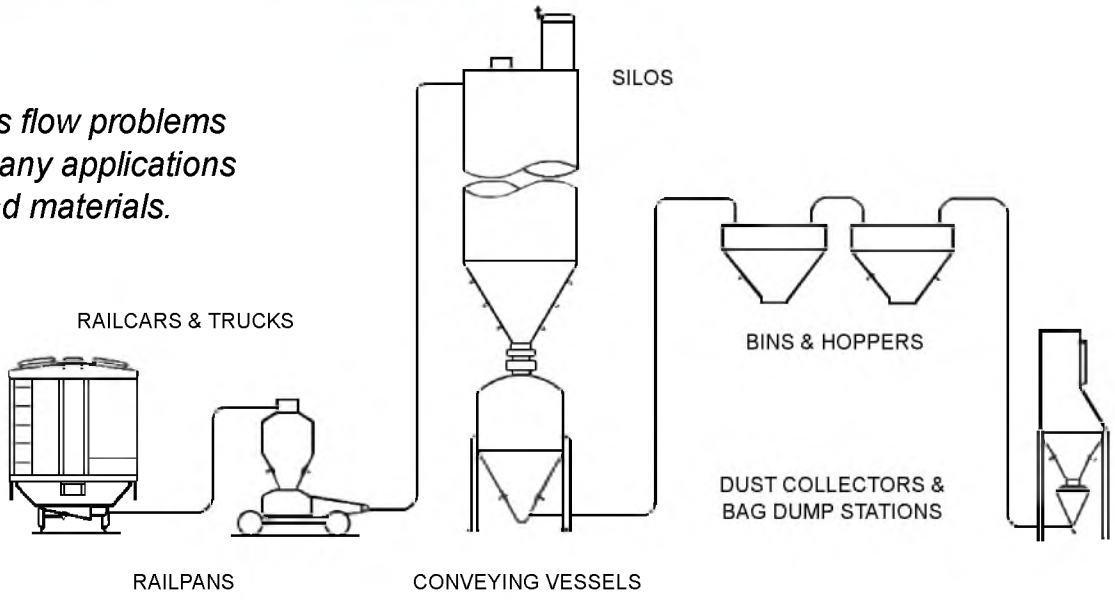


PARTS DESCRIPTION

1. White Silicone rated at 400° F or Neoprene Pad rated at 250° F
2. 303 SS Stud
3. White Sealing Washer
4. 7/8" Flat Washer
5. 7/8"-14 UNF Hex Nut

The special design creates a vibration as the air flows between the Airbrator's boot and the bin wall. This provides a very effective flow aid for all types of dry products. Plus, Airbrator pads do not require a specific air pressure for operation. Blower air from as low as 5 PSIG to high pressure air up to 60 PSIG can be used with the Airbrator.

Solves flow problems with many applications and materials.



Suitable for Granular or Powdered Materials

Alumina	Flyash
Ash	Flour
Bag House Dust	Fluorspar
Barlite	Gypsum
Bentonite	Lime
Carbon Black	Perlite
Cement	PVC Resin
Clay	Salt
Calcium Carbonate	Sand
Cornstarch	Soda Ash
Cement Clinker	Soap Powder
Diatomaceous Earth	Talc

The smarter way to...
Monitor Bin Levels & Manage Inventory

BinCom modules allow a SmartBob sensor to send data to the BinView web application to give you instant access to bin level data on any device with an Internet connection. Your SmartPhone, tablet, or PC can be used to get timely, remote data access to all of your level measurements from local and corporate-wide locations. BinCom combines the benefits of low-power, wireless technology and cellular data transfer to make it super simple to get SmartBob data where and when you need it.

The Dashboard provides drop distance, product height, and percentage full.

Automated Level Measurement Optimizes Inventory Management

BinCom helps you manage the inventory of powders and solids in bins, tanks and silos either on premises, at other corporate locations, or a customer or vendor location miles away. By knowing when vessels are reaching empty and are ready to be filled, you can optimize purchasing, eliminate out-of-stocks, reduce safety stocks, and plan delivery schedules. For busy organizations, this saves time while being smart about cash flow and inventory carrying costs, while improving customer satisfaction. If you use BinCom for VMI (vendor managed inventory), you can work closely with vendors or customers by sharing reliable, timely information to simplify and coordinate business between both operations.

How you benefit from the BinCom solution:

- **Access inventory levels whenever and wherever you need them**
- **Get automated text or email alerts where vessels are ready to fill**
- **Data visibility and sharing for VMI (vendor managed inventory) programs**
- **Prevent out-of-stocks, reduce safety stocks and inventory carrying costs**
- **Controlled access to data by individuals within your company or by your customers**
- **Save time, energy, manpower, and provide better customer service**
- **Eliminate manual measurements, eliminate climbing, and improve employee safety**

Applying BinCom to a SmartBob Installation

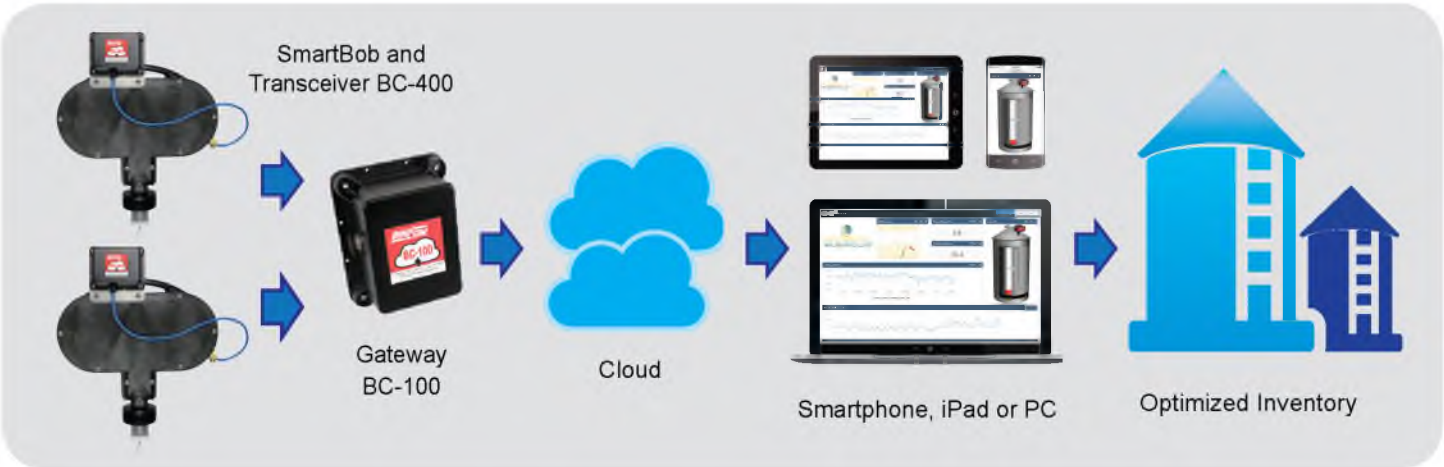
A battery-operated BinCom BC-400 transceiver is installed with each SmartBob sensor, either affixed to the SmartBob housing or installed close by. When the SmartBob sensor takes a measurement at its predetermined interval, the BinCom BC-400 transceiver "wakes up" and sends level data via a BinCom BC-100 gateway over a secure Cellular data transfer network to BinView application software in the Cloud. The data is accessed by authorized users via the Internet via a SmartPhone, tablet, or PC using secure login credentials assigned by an administrator.

Inventory Anywhere

Data is populated in BinView in a viewer-friendly window optimized for each type of device. The percentage full, drop distance, and product height are boldly displayed, along with historical trends for product height and percentage full. Battery levels for the BinCom module are also monitored via the dashboard. Other enhancements include customization with your logo for easy identification whether BinView is accessed only within the organization or in VMI.

The BinCom module uses wireless communications and is powered by a common 9V battery. As data is sent to BinView only when SmartBob takes a new measurement, the battery lasts up to 5 years and it easy to replace. BinCom offers intuitive plug and play setup that requires no special knowledge or programming. There are a variety of low-cost data plans available based upon the number of vessels being measured and how frequently measurements are reported back to the web site.

The BinCom SmartBob solution can also be used along with a C-100 console, for operations that want a push-button console for on-demand measurements and for the convenience of drivers or other personnel working on the premises.



BINMASTER®

PT-500 Analog Output Series
User Manual

4-20 mA, 0-5 VDC, 0-10 VDC, mV/V

BINMASTER®

Doc #9004194
Rev A2, 08/16

Table of Contents

Introduction

Thank you for purchasing a PT-500 Analog Output series submersible pressure transmitter from BinMaster. We appreciate your business! Please take a few minutes to familiarize yourself with your PT-500 and this manual.

PT-500 submersible pressure transmitters offer reliability in harsh industrial conditions and hazardous locations. The 4-20 mA model is certified intrinsically safe for hazardous areas in the US and Canada by CSA for Class I, Division 2, Groups C and D, Class I, Zone 2, Group IIB, and Class I, Division 1, Groups C and D, Class I, Zone 0, Group IIB environments. The small size, integrated electronics, wide operating temperature range, and durability make the PT-500 the perfect instrument for static and dynamic pressure measurement.

Reading your label

The PT-500 comes with a label that includes the instrument's model number, part number, serial number, and a wiring pinout table. Please ensure that the part number and pinout table on your label match your order. The following electrical ratings and approvals are also listed on the label. Please request the Certificate of Compliance and Declaration of Conformity for further details.

Electrical ratings

Input: 10 to 28 Volts DC; Output: 4-20 mA
Exia Class I, Division 2; Groups C, D T4
Class I, Zone 2, Group IIB
AEx nC IIB T4: Ta: -40°C to 85°C
Ex nL IIB T4: Ta: -40°C to 85°C
Maximum Working Pressure: 10,000 PSI

Vmax U_i= 28VDC, Imax I_i = 110mA, Pmax P_i = 0.77W, C_i = 0µF, L_i = 0µH
Install in accordance with drawing 9002803, sheet 2 (page 9).

Input: 10 to 28 Volts DC; Output: 4-20mA
Exia Class I, Division 1; Groups C, D T4
Class I, Zone 0, Group IIB
AEx ia IIB T4: Ta: -40°C to 85°C
Ex ia IIB T4: Ta: -40°C to 85°C
Maxium Working Pressure: 10,000 PSI

Vmax U_i= 28VDC, Imax I_i = 110mA, Pmax P_i = 0.77W, C_i = 0.042µF, L_i = 0.320µH
Install in accordance with drawing 9002803, sheet 1 (page 8).

IMPORTANT: Your 4-20 mA PT-500 MUST be installed according to drawing 9002803 (Intrinsically Safe Wiring Diagram or Non-Incendive Wiring Diagram) as indicated above to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

Warranty and Warranty Restrictions

BinMaster warrants this product against defects in material and workmanship for two (2) years according to the following terms;

1.) This warranty extends to the original purchaser only and commences on the date of original purchase.

2.) BinMaster's sole obligation under said warranty is to repair, or at its option replace the defective parts. The buyer shall have no other remedy. All special, incidental and consequential damages are excluded. The buyer must deliver the product under warranty prepaid to the factory. BinMaster's obligation is limited to the cost of material and labor to repair or replace, and does not include transportation expenses.

3.) This warranty shall be voided, in our sole judgment, by alterations of equipment except by BinMaster, or tampering with, improper installation or maintenance, accident or misuse, or act of God. This warranty expressly excludes all damage to the product resulting from careless or neglectful packaging or transportation. The warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied including any implied warranties or merchantability or fitness for particular purpose. No employee, agent, franchise dealer or other person is authorized to give any warranties of any nature on behalf of BinMaster.

5) BinMaster shall in no event be responsible for any warranty work done without first obtaining BinMaster's written consent.

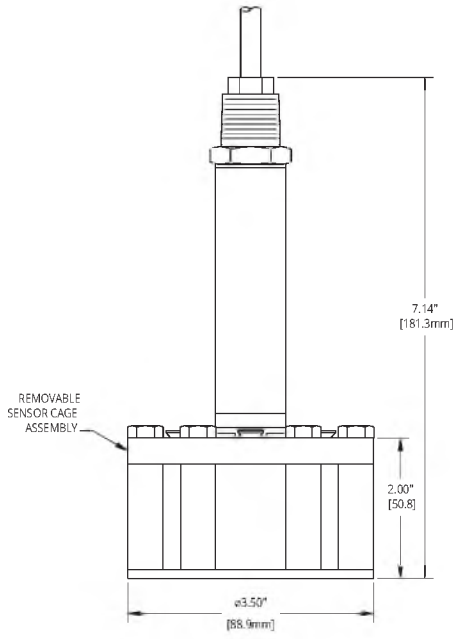
6) Except as provided herein, BinMaster shall have no liability, loss or damage caused or alleged to be caused directly or indirectly by this equipment.

7) This warranty gives the buyer specific legal rights, and you may also have other rights which vary from state to state.

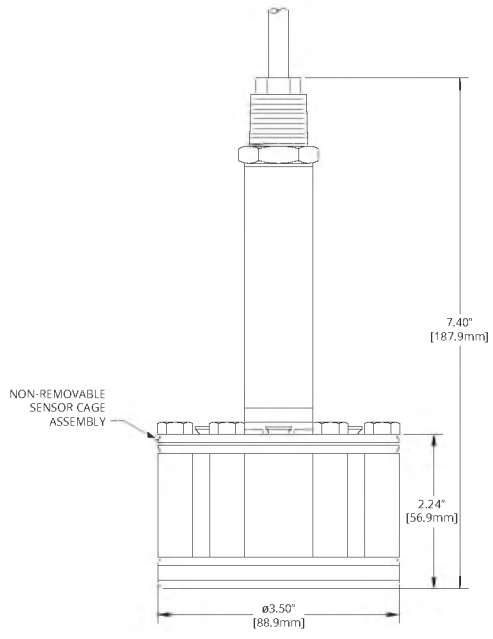
8) For service, please call 402-434-9102.

Chapter 1: Specifications and Options

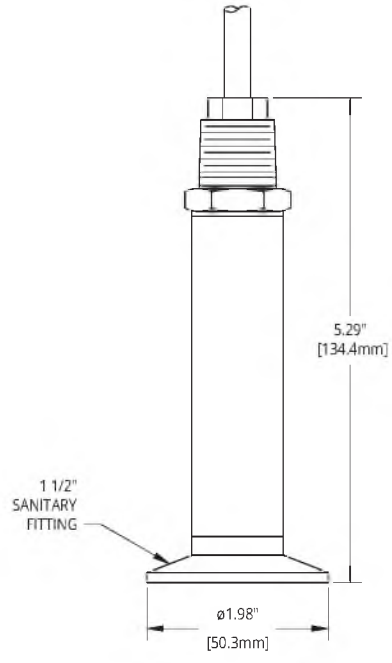
- **Dimensions**



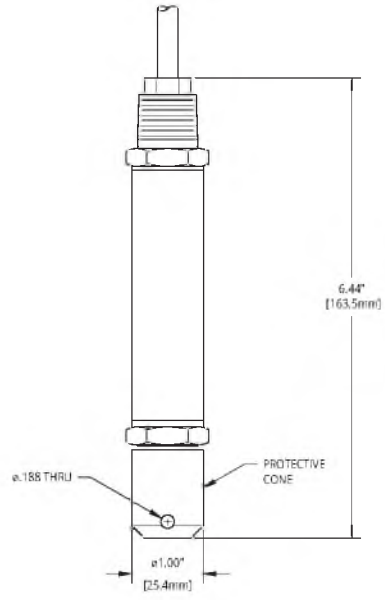
PT-500 with Reusable Cage



PT-500 with Welded Anti-snag Cage



PT-500 with Tri-clover
Sanitary Fitting



PT-500 with Removable Plastic
Nose Cone

Specifications

Performance

Pressure Ranges	0 to 300 PSIG
Analog Outputs	4-20mA, 0-5VDC, 0-10VDC, mV/V
Over Pressure	2X FSO
Burst Pressure	3.0X FSO
1 Year Stability	0.75% FSO

Accuracy

Linearity, Hystereses & Repeatability	±0.25% of Full Scale (BFSL) up to ±0.1% of Full Scale
Thermal Zero Shift @ 70 °F	±0.045% FSO/°C (±0.025% FSO/°F)
Thermal Span Shift @ 70 °F	±0.045% FSO/°C (±0.025% FSO/°F)

Environmental

Operating Temperature	-40 to 85°C (-40 to 185°F)
Compensated Temperature	-17 to 54°C (0 to 130°F)
Maximum Submersible Depth	462.2 ft / 140.88 m / 300 psig

Electrical

Supply Voltage (at sensor)	4-20 mA: 9-28 VDC 0-10 VDC: 14-28 VDC 0-5 VDC: 9-28 VDC mV/V: 10 VDC*
Output Signal @ 21°C	3-30 mA max.
Protection	Reverse Polarity and Surge (per IEC 61000-4-5)
Load Limitation	$R_{(max)} = ((V_s-12V)/0.02A)-(0.042\Omega$ per ft. of cable)
Startup Time	4-20 mA: 100 ms 0-10 VDC: 300 ms 0-5 VDC: 300 ms
Current Draw	4-20 mA: 3-30 mA 0-10 VDC: 3 mA 0-5 VDC: 3 mA

Materials of Construction

Wetted Materials	316L Stainless Steel
Anti-snag Cage	316L Stainless Steel
Cable	Urethane, PVC, or Hytrel
Protective Nose Cone	Delrin
Seal	Viton ETP-s

Mechanical

Pressure Connection	See model number configurator for complete list
Cable Tensile Strength	Up to 200 pounds

Patents

US Patent No. 7,787,330

*mV/V output is calibrated to 10 VDC input.

• Model Number Configurator

Part Number: PT-500____ - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____
A B C D E F G H

A. Cable Type

- □ **-**▲ Urethane - Blue (with vent tube)
- □ **A** PVC - Black (no vent tube - sealed unit)
- □ **B** Hytrel .31" Ø - Black (with vent tube)
- □ **C** PVC - Black (with vent tube)
- □ **D** Hytrel .25" Ø - Black (with vent tube)

B. Pressure Range

□ Specify range in desired unit of measure

_____ Max Water Depth
462.2 ft. (140.9 m), 300 psig

C. Standard Units of Measure

- □ **PSI** □ **FTH2O** □ **INWC**
- □ **INH2O** □ **MMH2O** □ **FWC**

D. Output

- □ **L1**▲ 4-20 mA, 2-wire
- □ **L3** 0-5V, 4-wire*
- □ **L9** 10 mV/V, 4-wire*
- □ **L10** 0-10V, 4-wire*

□ **L5** Modbus RTU, 4-wire RS-485*
Pressure reading only

□ **L31** Modbus RTU, 4-wire RS-485 *
Level calculations, tank volume

E. NPTM

- □ **E0**▲ 1/2" NPTM fitting for conduit, with pigtail
- □ **E5** Pigtail without conduit connection

F. Process Connection

- □ **P1**▲ 1/2" NPTM with removable plastic nose cone
- □ **P5** 1/4" NPTF
- □ **P37** Welded Cage (anti-snag 1 piece fitting)
- □ **P38** 1-1/2" tri-clover with 3/4" diaphragm
- □ **P39** Reusable Cage (includes P38 fitting)

G. Cable Length

□ (specify length of cable needed in feet)

H. Accuracy

- □ **N0**▲ ±0.25%
- □ **N1** ±0.25% with NIST certification
- □ **N2** ±0.1% with NIST certification

Note: ▲Indicates this option is standard.
Note: *Indicates this option does not yet have CSA Approvals.

- **Electrical Pinout Table and Supply Power Table**

PT-500 Analog Output Series Pin Out Table

		4-20 mA	Voltage
Pigtail	Red	+ Power/Signal	+ Power
	Black	- Power/Signal	- Power
	Green	-	+ Out
	White	-	- Out
	Shield	Case Gnd	Case Gnd

PT-500 Analog Output Series Supply Power Table

	4-20 mA	0-5 VDC	0-10 VDC	mV/V
Power Supply	9-28 VDC	9-28 VDC	14-28 VDC	10 VDC*

* mV/V output calibrated to 10 VDC input

Chapter 2: Installation and Removal Procedures and Notes

- **Tools Needed**

  - Wrench sized appropriately for your PT-500's process or conduit connection.
  - Thread tape or sealant compound for threaded connections.

- **Mounting Instructions**

Your PT-500 can be mounted in three ways: via NPT process connection, free-hanging suspension, or conduit mounted. Mounting your pressure transducer is easy if you follow a few simple steps:

  - Never over-tighten the sensor. This can compress the diaphragm, changing how it reacts to pressure. In all cases, tighten the sensor as little as possible to create an adequate seal. On straight threads, tighten only until you feel the o-ring compress - making sure you don't damage or extrude the o-ring.
  - Always use thread tape or sealant compound on tapered threads. Wrap thread tape in the opposite direction of the threads so it does not unravel as you screw the sensor into place. Unraveling can cause uneven distribution and seal failure. For straight threads use an o-ring.
  - Always start screwing in your sensor by hand to avoid cross-threading. Thread failure can be a problem if you damage threads by over-tightening them or by crossing threads.
  - For suspension mounting the PT-500, drill a 3/16" hole into a 1/2" NPTF to 1/2" NPTF hex coupler and secure it to the 1/2" NPTM coupler fitting of the PT-500. Attach a .060" diameter 316L SS cable of desired length to the hex coupler and secure the steel cable according to your application requirements.

- **Electrical Installation**

  - Attach the wires of your PT-500 to your control system according to the pinout table above.

NOTE: If your PT-500 has a vent tube, do not seal, cover, or close the vent tube with anything other than an BinMaster-provided venting cap or desiccant drying cartridge (See Figure 3.3 and 3.4). Unapproved seals or covers will prevent proper sensor operation.

- **Removal Instructions**

Removing your PT-500 from service must be done with care. It's easy to create an unsafe situation, or damage your sensor, if you are not careful to follow these guidelines:

- For sensors installed via NPT process connection, make sure the pressure is completely removed from the line or vessel. Follow any and all procedures for safely isolating any media contained inside the line or vessel.
- Remove the sensor with an appropriately sized wrench (per your process connection).
- For suspended sensors, retrieve the sensor from the vessel. Follow any and all procedures for safely isolating any media contained inside the line or vessel.
- Carefully clean the sensor's fitting and diaphragm of any debris (see General Care) and inspect for damage.
- Store your sensor in a dry place, at a temperature between -40° F and 180° F.

DANGER: Removing your process connected PT-500 Pressure Transmitter while there is still pressure in the line could result in injury or death.

Chapter 3: Maintenance

- **General Care**

Your PT-500 series pressure transmitter is very low maintenance and will need little care as long as it is installed correctly. However, in general, you should:

- For process connected sensors, keep the transmitter and the area around it generally clean.
- Avoid applications for which the transmitter was not designed, such as extreme temperatures, contact with incompatible corrosive chemicals, or other damaging environments.
- Inspect the threads whenever you remove the transmitter from duty or change its location.
- Avoid touching the diaphragm. Contact with the diaphragm, especially with a tool, could permanently shift the output and ruin accuracy.
- Clean the diaphragm or the diaphragm bore only with extreme care. If using a tool is required, make sure it does not touch the diaphragm.

IMPORTANT: Any contact with the diaphragm can permanently damage the sensor. Use extreme caution.

• Zero Adjust (4-20 mA, 0-5 VDC, and 0-10 VDC only)

The zero output (4mA, or 0 VDC) can be adjusted by holding a magnet perpendicular to the can, approximately 1-1/2" from the top or bottom of the can.

Holding the magnet close to the top of the can increases the output (See Figure 3.1). Holding the magnet close to the bottom of the can decreases the output (See Figure 3.2).

If the zero output values do not change right away, hold the magnet in place near the top of the can until the values change, for up to two minutes. If there is no change, repeat the procedure near the bottom of the can. If there is still no change, consult the factory.

Unvented PT-500A transmitters do not automatically adjust to changes in barometric pressure. We recommend that PT-500A transmitters be zeroed upon receipt, and after major weather events.

Figure 3.1

Figure 3.2

NOTE: Span calibration must be done at the factory for all analog models.

• Vent Tube Drying

Condensation in the vent tube can damage the electronics in your sensor, resulting in unreliable readings. BinMaster offers two methods of preventing vent tube condensation: a venting cap, and a desiccant drying cartridge.

The venting cap is a PVC tube with a hydrophobic patch that allows moisture to pass out of the tube without allowing water in (See Figure 3.3). The cap is sealed by an o-ring, and is easily installed in the field.

The desiccant drying cartridge with vent tube adapter absorbs any moisture in the vent tube to keep vapor from condensing (See Figure 3.4). The installation of the desiccant drying cartridge is quick and easy. Common installation methods are cable tie, Velcro, and cable clamps.

Figure 3.3

Figure 3.4

NOTE: Desiccant crystals change from blue to pink as they become saturated. Cartridge must be replaced when all crystals have saturated.

IMPORTANT: Do NOT use desiccant cartridge in the presence of vapors or liquids containing phosphate esters, synthetic lubricants, hydrocarbon solvents, methanol, acetone, lacquer solvents, or other organics.

- ## Repair and Returns

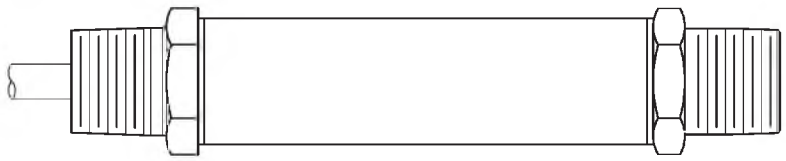
Should your PT-500 series pressure transmitter require service, please contact the factory. We will issue you a Return Material Authorization (RMA) number with instructions.

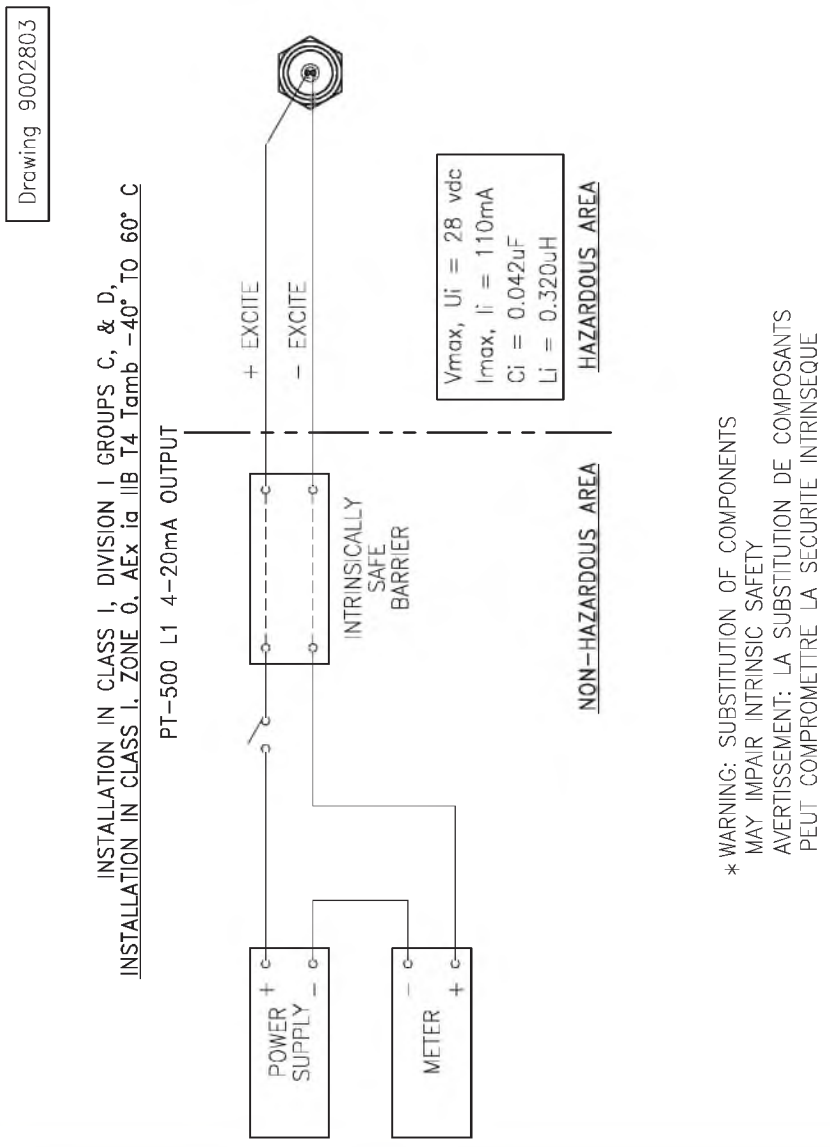
- Phone: 402-434-9102
- Email: info@binmaster.com

Please have your PT-500's part number and serial number available. See Warranty and Warranty Restrictions for more information.

Chapter 4: Hazardous Location Installation and Certification

- **Intrinsically Safe Wiring Diagram**



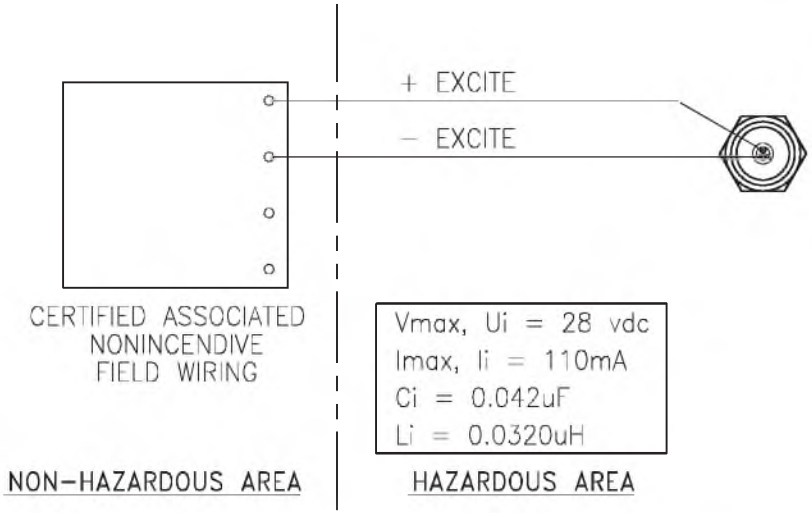


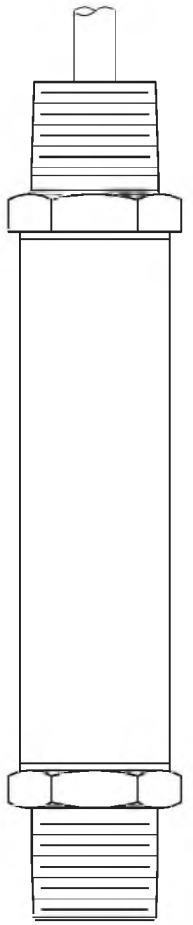
• Non-Incendive Wiring Diagram

Drawing 9002803

NONINCENDIVE WIRING FOR INSTALLATION IN
CLASS I DIVISION 2 GROUPS C, & D
CLASS I, ZONE 0, AEx ia IIB T4 Tamb −40° TO 60° C

PT−500 L1 4−20mA OUTPUT





* WARNING: SUBSTITUTION OF COMPONENTS
MAY IMPAIR INTRINSIC SAFETY
AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS
PEUT COMPROMETTRE LA SECURITE INTRINSEQUE

IRU-2420 Self-Contained Ultrasonic Level Sensor

Liquid Level Sensor

The IRU-2420 series provides a non-contact method of detecting level, presence/absence detection, volume, proximity and distance. With built-in technology to compensate for unpredictable variables such as humidity, temperature and agitators, the IRU-2420 is an ideal sensor for many applications.

Features

- AutoSense software for hassle-free setup
- Internal temperature compensation
- Operating range up to 25 feet

BINMASTER

MADE IN USA

IRU-2420 Specifications

Performance

- Operating Range
  1 - 25 ft. (0.3 - 7.6 m)
- Beam Pattern: 9º off axis
- Internal Temperature Compensation
- Frequency: 69 kHz
- Accuracy: ±0.25% of detected range
- Resolution: 0.1 in. (2.5 mm)
- Response Time: Programmable (20 ms minimum)

Connectivity

Output:

- 4-20 mA
  600 ohms @ 24 VDC
  150 ohms @ 12 VDC
- 4-20 mA with (2) NPN outputs

Environmental

- Ratings: IP65
- Operating Temp: -40º - 140ºF (-40º - 60ºC)

Electrical

- Total Current Draw: 75 mA @ 24 VDC
- Supply Voltage: 12-28 VDC
- Wiring Connection: 4 or 5 conductor shielded cable

Programming

- Interface with RST-3001/3002 Programmer
  (purchase separately - powered by USB)
  -The RST-3001 is 32 bit only
  -The RST-3002 is 32 and 64 bit compatible
- User selected units of measure

Physical

- PVDF (Kynar®) transducer housing
- PC/PET upper housing
- Transducer Type: Ceramic, PVDF faced

Certification

- Class 1, Div. 2, Groups A, B, C, D
- IP65

IRU-3430 Self-Contained Ultrasonic Level Sensor

Liquid Level Sensor

The IRU-3430 series provides a non-contact method of detecting level, presence/absence, volume, proximity and distance. With built-in technology to compensate for unpredictable variables such as humidity, temperature and agitators, the IRU-3430 is an ideal sensor for many applications.

Features

- AutoSense software for hassle-free setup
- Internal temperature compensation
- Operating range up to 50 feet

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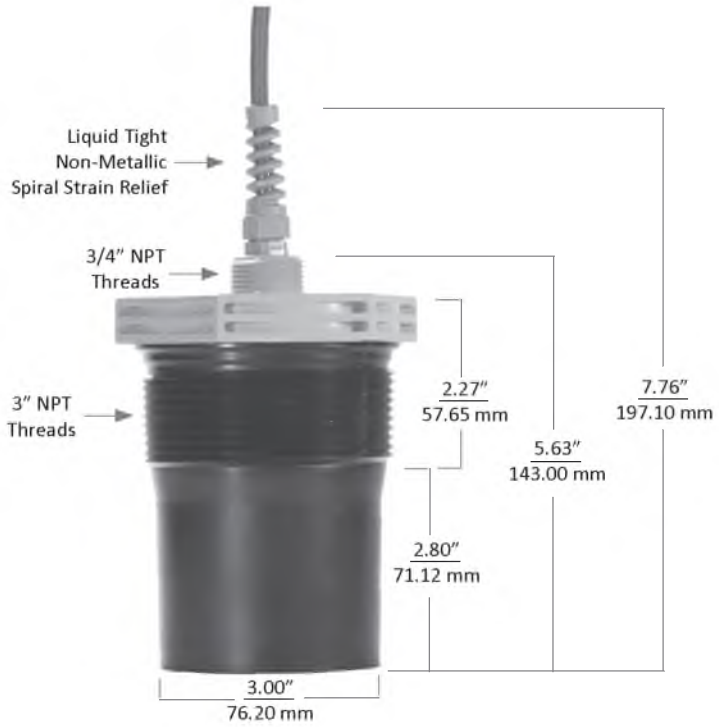
IRU-3430 Specifications



Performance

- Operating Range
  1.25 - 50 ft. (0.4 - 15.2 m)
- Beam Pattern: 9º off axis
- Internal Temperature Compensation
- Frequency: 43 kHz
- Accuracy: ±0.25% of detected range
- Resolution: 0.1 in. (2.5 mm)
- Response Time: Programmable (20 ms minimum)

Connectivity

Output:

- 4-20 mA
- 4-20 mA with (2) NPN outputs

Environmental

- Ratings: IP65
- Operating Temp: -40º - 140ºF (-40º - 60ºC)

Certification

- Class 1, Div. 2, Groups A, B, C, D
- IP65

Electrical

- Total Current Draw: 75 mA @ 24 VDC
- Supply Voltage: 12-28 VDC
- Wiring Connection: 4 or 5 conductor shielded cable

Programming

- Interface with RST-3001 Programmer
  (purchase separately - powered by USB)
  -The RST-3001 is 32 bit only
  -The RST-3002 is 32 and 64 bit compatible
- User selected units of measure

Physical

- PC/PET upper housing
- PC/PET Blend Transducer

IRU-5000 Self-Contained Ultrasonic Level Sensor

Liquid Level Sensor

The IRU-5000 series provides a non-contact method of detecting level, presence/absence, volume, proximity and distance. With built-in technology to compensate for unpredictable variables such as humidity, temperature and agitators, the IRU-5000 is an ideal sensor for many applications.

Features

- AutoSense software for hassle-free setup
- Internal temperature compensation
- Operating range from 4 to 79 inches
- Ideal for small tanks

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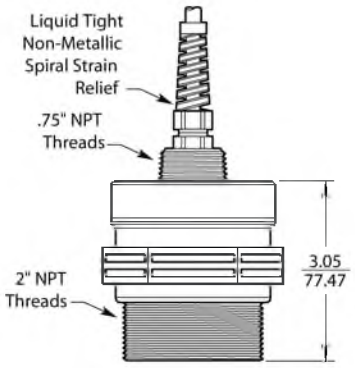
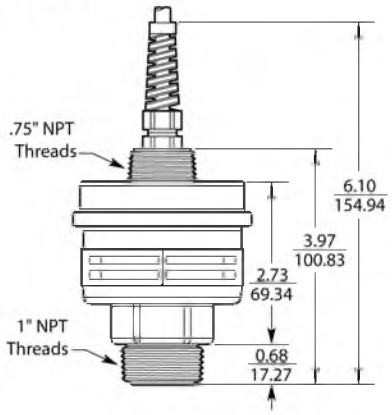
IRU-5000 Specifications

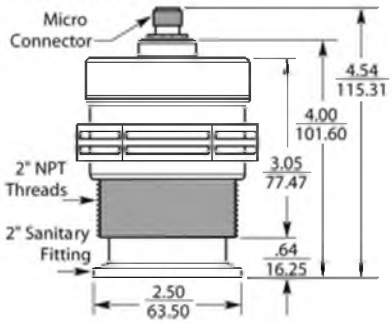
IRU-5420



IRU-5410



IRU-5320



Performance

- Operating Range
  4 - 79 in. (102 - 2007 mm)
- Beam Pattern: 9º off axis
- Internal Temperature Compensation
- Frequency: 143 kHz
- Accuracy: ±0.25% of detected range
- Resolution: 0.1 in. (2.5 mm)
- Response Time: Programmable (20 ms minimum)

Connectivity

Output:

- 4-20 mA
- 4-20 mA with (2) NPN outputs
- 0-2.5 V/0-5 V

Environmental

- Ratings: IP65
- Operating Temp: -40º - 140ºF (-40º - 60ºC)

Certification

- Class 1, Div. 2, Groups C, D, T6; Ex nA IIB T6
- Class 1, Zone 2, Aex nA IIB, T6
- IP65

(*Models IRU-5413, -5415, -5423 & -5425 only)

Electrical

- Total Current Draw: 75 mA @ 24 VDC
- Supply Voltage: 12-28 VDC
- Wiring Connection: 4 or 5 conductor shielded cable

Programming

- Interface with RST-3001 Programmer
  (purchase separately - powered by USB)
  - The RST-3001 is 32 bit only
  - The RST-3002 is 32 and 64 bit compatible
- User selected units of measure

Physical

- PC/PET upper housing
- PC/PET Blend Transducer

LPU-2127 Loop Powered Ultrasonic Level Sensor

Liquid Level Sensor

With a built-in keypad for easy programming and flexibility, the LPU-2127 provides continuous level/ distance measurement you can count on. Its durability, range, and simplicity make it a great sensor for many applications.

Features

- 1 - 25 ft. (0.3 - 7.6 m) detection range for liquids
- Loop powered 4-20 mA output
- Integrated keypad and LCD display

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LPU-2127 Specifications

Performance

- Operating Range
  1 - 25 ft. (0.3 - 7.6 m) on liquids
  1 - 10 ft. (0.3 - 3 m) on solids
- Beam Pattern: 9º off axis
- Internal Temperature Compensation
- Frequency: 69 kHz
- Accuracy: ±0.25% of detected range
- Resolution: 0.1 in. (2.5 mm)
- Response Time: Dependent on output ranges from 0.6 - 3 seconds
- Sample Rate: 3 seconds at 4mA - 0.6 seconds at 20mA

Connectivity

- Output:
  4-20 mA (loop-powered)
  600 ohms @ 24 VDC
  150 ohms @ 12 VDC

Environmental

- Ratings: IP65
- Operating Temp: -40º - 140ºF (-40º - 60ºC)

Certification

- Class 1, Div. 2, Groups C & D
- Class 1, Zone 2, AEx nA IIB T6

Electrical

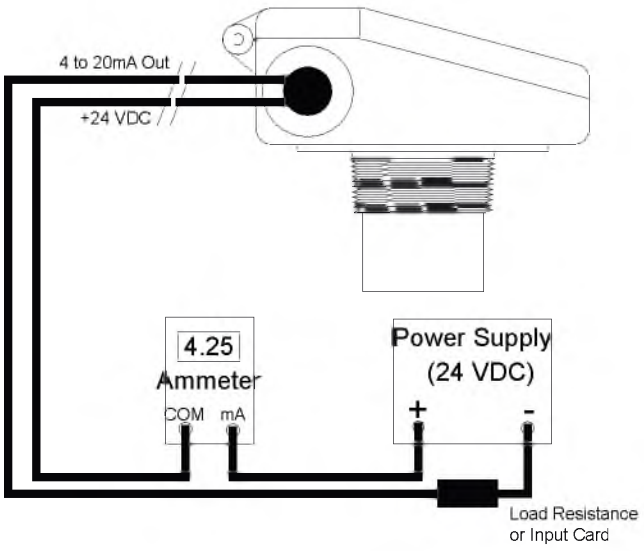
- Cable Connection: 2-terminal connector
- Total Current Draw: 4-20 mA
- Supply Voltage: 12-28 VDC

Programming

- Integrated keypad and LCD display

Physical

- PVDF (Kynar®) transducer housing
- PET upper housing
- Transducer Type: Ceramic, PVDF face



MPX Magnetostrictive Level Sensor Series

Liquid Level Sensor

The MPX Series magnetostrictive level sensor provides highly accurate and repeatable level readings in a wide variety of liquid level measurement applications. The MPX-R's large, buoyant and robust float allows it to be used in harsh applications where fouling or buildup might otherwise be of concern. The MPX-E's lighter weight design allows it to be used in applications where space is limited.

Features

- Class 1, Division 1, Groups C & D, Class 1, Zone 1, Class 1, Zone 2
- Highly accurate and repeatable readings
- 4-20 mA, RS-485 (Modbus RTU) output
- Rugged and reliable, custom lengths up to 25 feet (7.62 m)
- Dual level (interface) measurement
- Tank volume/level, strapping table

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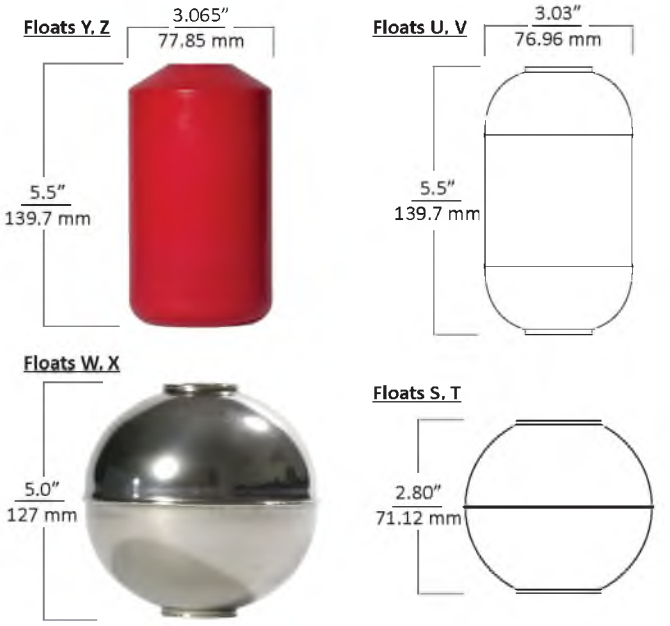
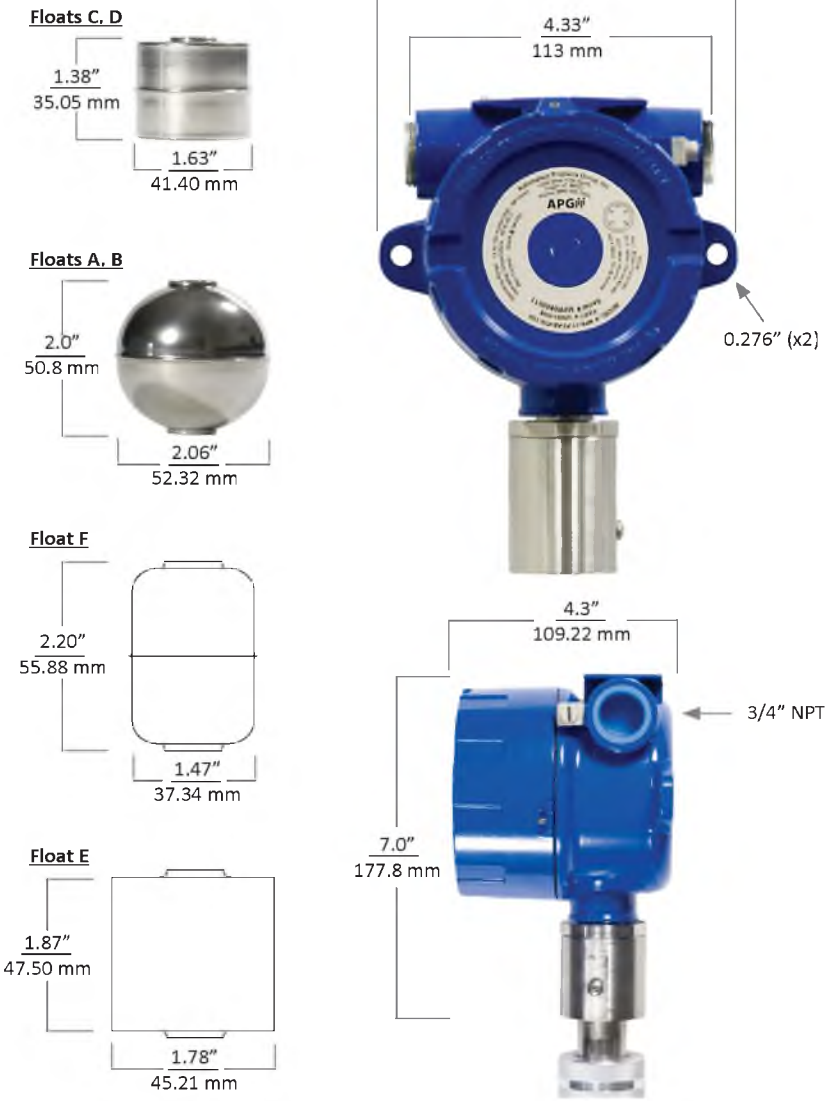
MPX Specifications

MPX-R Floats



MPX-E Floats



Performance

- Resolution:
  4-20 mA: 14 bit DAC
  Modbus: 0.04 in. (1mm)
- Accuracy:
  ±0.05% of full scale

Programming

- RS-485: optional RST-6001
  USB to RS-485 converter
- 4-20 mA: factory set or optional
  RST-4100 programming module.

Connectivity

- Output:
  Single or dual loop powered 4-20 mA
  Modbus RTU (RS-485)
  - Temperature output

Environmental

- Operating Temperature:
  -40º - 185ºF (-40º - 85ºC)
- NEMA 4X, IP65

Certification

MPX-E / MPX-R

- NEMA 4X, IP65
- Class I Division 1 Groups C & D T4 (Ta 85°C)
  Class I Division 2 Groups C & D T4 (Ta 85°C)
  Class I, Zone 1; AEx d IIB T4
  Class I, Zone 2; AEx nA IIB T4
  Ex d IIB T4
  Ex nA IIB T4

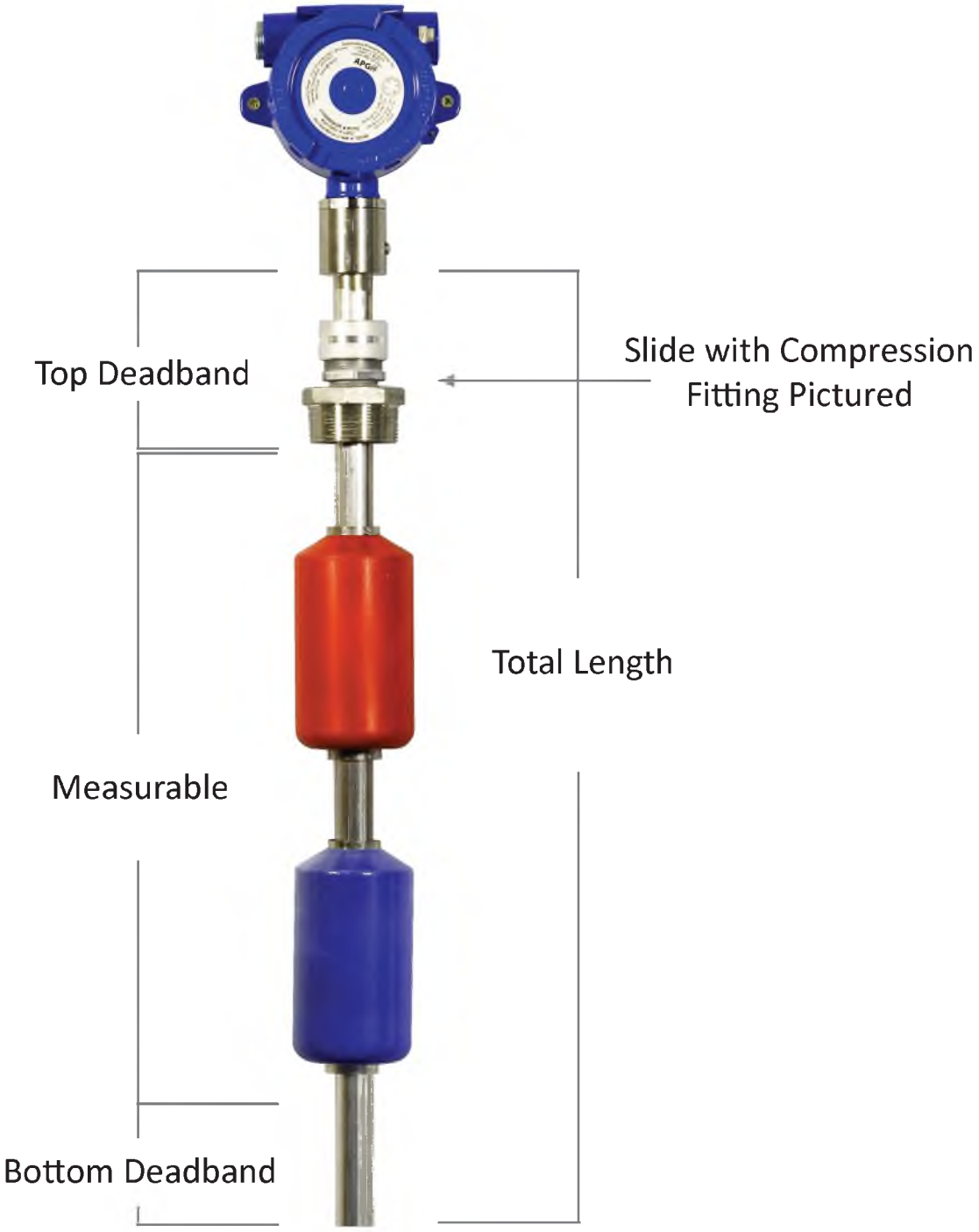
Electrical

- Electrical Connection: Terminal Block
  12-24 vdc
- Total current draw:
  MPX-E: 4-20 mA: (single) 22 mA, (dual) 44 mA
  MPX-R: 4-20 mA: (single) 22 mA, (dual) 44 mA
  MPX-E: Modbus (RS-485): 25 mA
  MPX-R: Modbus (RS-485): 28 mA

Physical

- Housing: Cast aluminium, epoxy coated
- Stem: 304 SS or 316L SS
- Stem Length:
  MPX-E: 12 - 153 in. (0.3 - 3.9 m)
  MPX-R: 4 - 25 ft. (1.22 - 7.62 m)

MPX Specifications



PT-400 Amplified Output Pressure Transducer

Liquid Level Sensor

The PT-400 offers high accuracy and reliability over a wide range of pressures. The small size, integrated electronics, wide operating temperature range, ATEX and IECEx approval, and durability, make the PT-400 the perfect instrument for static and dynamic pressure measurements with an amplified output signal.

Features

- Available ranges from 0 - 40,000 psi
- Standard outputs: 4-20 mA, 0-5 VDC, 0-10 VDC, RS-485
- High overpressure capability
- Zero and span adjustments
- cCSAus hazardous location approved
- ATEX approved
- IECEx approved

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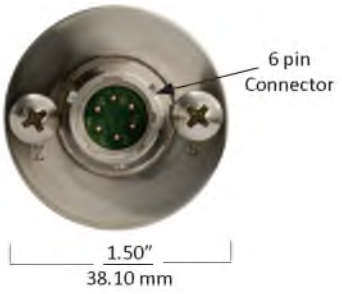
PT-400 Specifications



*Overall length may vary depending on process connection.

Performance

- Accuracy (linearity & hysteresis):
  ±0.25% of full scale (BFSL)
- Standard Pressure Ranges: 0 - 40,000 psi
- Stability - One Year Zero Drift:
  17-4 / 316L: <±0.5% FS
- Overpressure: 2x full scale
- Burst Pressure: up to 3x full scale or limit of process connection
- Frequency Response:
  Less than 5mS

Connectivity

- Output:
  4-20 mA (2 wire, loop-powered)
  0-5 VDC, 0-10 VDC (non-isolated 3 wire)
  Modbus/RTU (RS-485) with temp. output

Environmental

- Standard Compensated Temp.: -17º to 54ºC (0º to 130ºF)
- Storage Temp: -40º to 82º C (-40º to 180ºF)
- Operating Temp: -40º to 85º C (-40º to 185º F)

Physical

- Weight: 10 oz. (283 g) typical
- Wetted Materials: 17-4 SS, 316L SS

Electrical

- Supply Voltage: 9-28 VDC
- Electrical Connection:
  Pigtail with cable or connector
- Electrical Protection:
  Protected against reverse polarity, surge per IEC 61000-4-5

Certification

- CSA/cCSAus Contract #237484
  Ambient: -40º to 85ºC
  Max. Working Pressure: 10,000 psi
  0-5 VDC, 0-10 VDC, 4-20mA
  - IS: Class I, Div. 2, Groups C & D; Ex nL IIB T4
  - Class I, Zone 2; AEx nL IIB T4
  4-20 mA
  - IS: Class I, Div. 1, Groups C & D; Ex ia IIB T4
  - Class I, Zone 0; AEx ia IIB T4
- ATEX
  4-20 mA
  - Ex II 1G Ex ia IIB T4 Ga
- IECEx
  4-20 mA
  - Ex ia IIB T4 Ga

PT-L1-L3-L10
Pressure Transmitters

Liquid Level Sensor

Our amplified output pressure transmitters are the economical answer for all applications requiring high accuracy and reliability over a wide range of pressures. The PT-L1/L3/L10 pressure transmitters offer ranges from vacuum to 10,000 psi, all stainless steel construction, high burst pressure, and high acuracy.

Features

- Cost effective
- High overpressure capability
- Zero and span adjustments
- Single piece stainless steel process fitting and sensor

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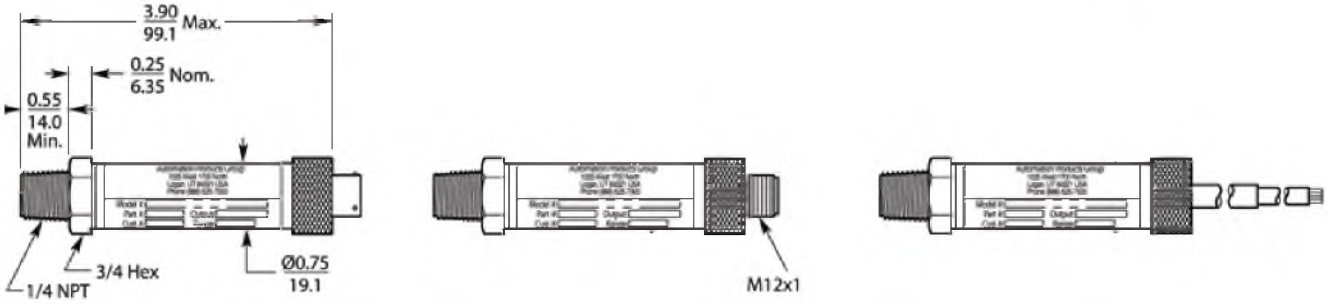
PT-L1/L3/L10 Specifications

Dimensions: in./mm



4- or 6-PIN BAYONET | 4-PIN M12 | PIGTAIL

Performance

- Accuracy
  B.F.S.L. ≤ 0.25% of full scale
  NIST up to ±0.1% available on select ranges
- Temp Compensation Range:
  Up to 0º - 130ºF (-17º - 54ºC)
- Extended Temp Compensation Range: (Optional)
  Up to -40º - 180ºF (-40º - 82ºC)

Connectivity

- Output:
  4-20 mA
  0-5 VDC
  1-5 VDC
  1-6 VDC
  0-10 VDC
- Internet Connectivity:
  RST-5001 (4-20 mA version only)

Environmental

- Operating Temperature:
  -40º - 180ºF (-40º - 82ºC)

Electrical

- Supply Voltage:
  4-20 mA: 10 - 36 VDC
  0-5 VDC: 9 - 33 VDC
  1-5 VDC: 9 - 33 VDC
  1-6 VDC: 9 - 33 VDC
  0-10 VDC: 14 - 33 VDC
- Electrical Protection:
  Reverse polarity

Physical

- Material: 15-5 or 316L SS

Programming

- Field Calibration:
  Zero and Span adjust

Anytime, Anywhere Inventory Monitoring

BinView is BinMaster's internet-based application for remote inventory monitoring of solids or liquids contained in tanks, bins, or silos. It is compatible with many of BinMaster's sensors as well as other sensors that have a 4 -20 mA analog output or Modbus RTU. BinView can be used to manage multiple vessels at multiple locations and is accessible from any device with a connection to the internet. Real-time inventory management and automated alerts can be accessed from a Smartphone, tablet or PC. BinView offers both security and control over your assets and users of the application. Super users can have the ability to set up and manage locations, gateways, and vessels, while other users may have view-only or receive alerts-only privileges. The system can be set up so that some users have access to all sites, while others may only be able to access data for a single location.

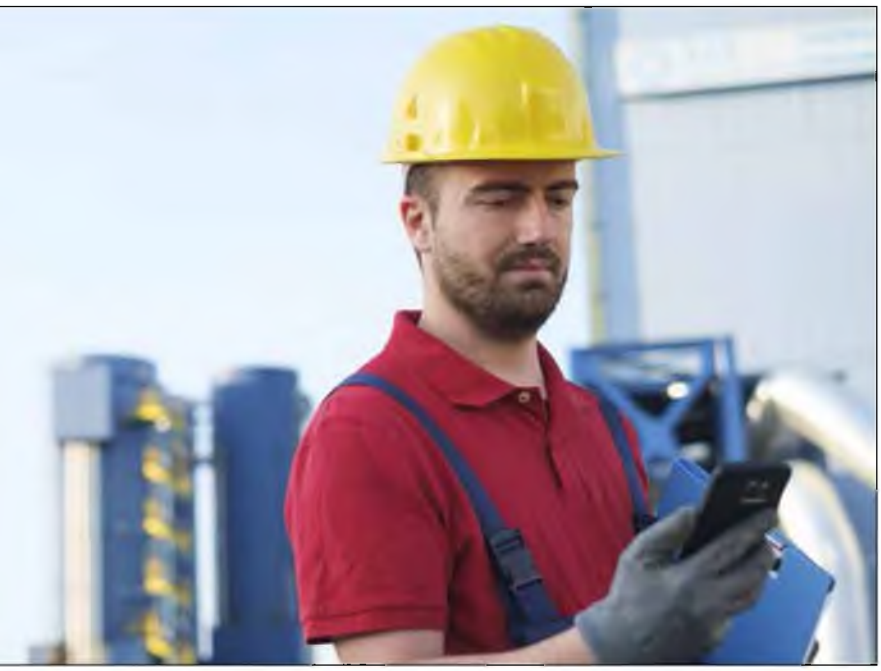
Easy Access

- **Remote monitoring via Smartphone, tablet, or PC**
- **24/7 monitoring anywhere there's internet access**
- **Accurate, reliable bin information updates automatically**
- **Automated alerts via email or SMS text message**
- **Wireless gateways and BinCom modules simplify installation**
- **Highly scalable for one or many vessels for one or multiple locations**
- **Eliminates manual monitoring to save time and enhance safety**
- **Historical reporting to optimize purchasing and logistics**

Access from a phone, tablet or PC.

BINMASTER®

Designed with the User in Mind



The user interface is very intuitive and easy to learn. Each user can customize what data columns are displayed and save their views for future use. Instructions for using BinView are built into the user interface and are displayed by simply hovering over an information icon. For critical actions in the application, popup warnings help to ensure information is not unintentionally deleted. Also, user access to specific information in the system can be controlled to prevent unauthorized or unneeded changes to the system.

The mobile version of BinView has been optimized and simplified for using BinView while in the field. Tank, location, gateway, and account pages are all available on the mobile version and simply presented for quick viewing.

Empowering Information Made Simple

The quick view graphical interface in BinView is clean and easy-to-understand. A tank overview provides the tank number, the percentage full, its location, the material contained in the vessel, the vessel status, and the date and time the data was last refreshed. The view is refreshed automatically every five minutes for the most current data. Filtering allows the user to view only the vessels they need to review. For example, a user may only be concerned for vessels with an alert status, contain a particular material, or from a single location.

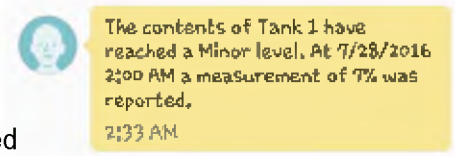
Reporting is one of the most powerful features of the BinView system. Current tank readings or tank history can be viewed in chart or tabular form. Reports can be run for all locations or a particular location and sorted by vessel, material, or alert status. Readings can be set as distance to product, percent full, or volume, if desired. Specific date ranges can be selected to view historical usage trends over time.

BinView is compatible with most any sensor with a 4-20 mA output or Modbus RTU.

BinView Basics

Alerts

- High and low level alerts can be established by individual vessel



Alert sent via SMS text.

Pop-up alert on a PC.

Phone

Tanks

Tank detail view

- See all tanks at all locations in a single view
- Quick View button allows you to see all of your tanks at a glance
- Dropdown arrow allows you to see more detail about each tank
- Drop & drag columns to your desired order and save the layout
- Sort each column by tank, location, product, latest reading time, status, and percent full

Gateways

- View how many gateways you have, which location they are serving, the brand of gateway, the last reading time, and how many tanks are associated with the gateway
- A Details button shows more information about the gateway, including its MAC address
- Drop & drag the columns to your desired order and save the layout

Tank view on a tablet

Location view on a PC

Locations

- Identify each location in your BinView network, its address, contact, phone number, and tank count at that address
- Clicking on the Details button provides more detailed information about each individual location
- Drop & drag the columns to your desired order and save the layout

Reports

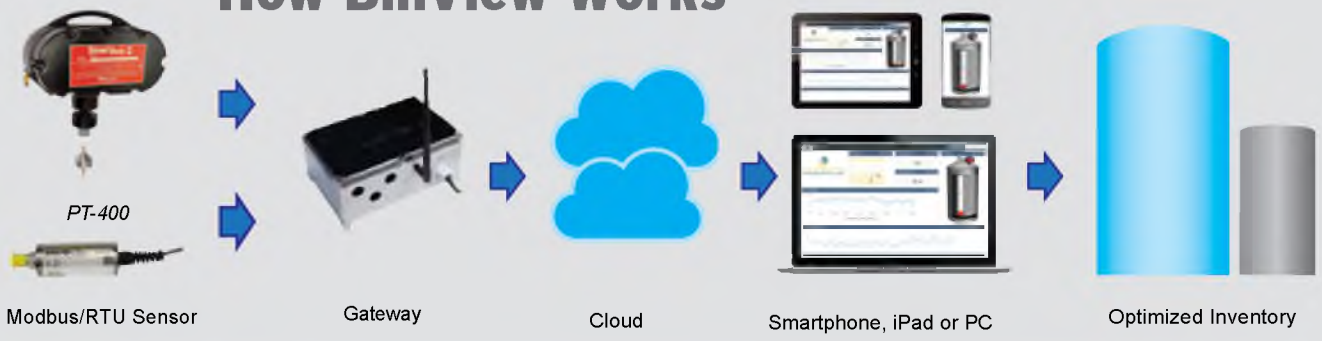
- Get historical or current data including Tank History or Current Readings
- Get the data in either a chart, table, or .csv file
- Specific date ranges are selectable for trend monitoring

Multiple Locations, Vessels, & Users

BinView is structured so that an account may have multiple locations and each location may have multiple gateways. Each gateway can be connected to one or more vessels, dependent on the type of gateway used. Each vessel can in turn have one or more sensors associated with it. This allows a great deal of flexibility for entities that have multiple operations over a wide geographical area.

BinView is ideal for managing inventory across multiple locations. Each individual location is assigned a location number and is associated with a street address, contact person, and contact phone number for the person managing BinView at the location. A google map image is also displayed of the location as well as the number of tank associated with BinView.

How BinView Works



Most any sensor measuring solids or liquids using a 4-20 mA output or Modbus RTU protocol is compatible with BinView. This cloud-based web application provides data access from your SmartPhone, tablet, or PC.

Sensor Compatibility

Solids

- SmartBob II
- SmartBob-TS1
- 3DLevelScanner
- NCR-80 Non-Contact Radar
- GWR-2000 Guided Wave Radar
- LL-100 Laser
- Sensors with 4-20 mA output or Modbus RTU

Liquids

- SmartSonic Ultrasonic
- SmartWave Radar
- MNU Ultrasonic
- MPE Magnetostrictive
- PT-400 Pressure Transducer
- PT-500 Submersible Pressure Transducer
- Sensors with 4-20 mA output or Modbus RTU

BINMASTER®

BV-0816-BLC ISO 9001:2008 Certified

Particulate Monitoring & Baghouse Leak Detection

The BM-30 LGX is a particulate monitoring device designed for general process and environmental monitoring. This particulate monitoring system consists of a control unit, a particulate sensor and a sensor coaxial cable. Applications for the BM30-LGX include continuous emissions monitoring, baghouse filter leak detection and process particulate flow monitoring. It detects many types of particulate including solid particulates such as dusts, powders, granulars and pellets. Particulate monitoring helps companies meet regulatory requirements by detecting leaks before emissions are visible, and prevents the escape of valuable powders while providing a cleaner, safer workplace.

Induction-Based Technology

The BM-30 LGX employs a highly reliable technology based on induction. A sensor probe is mounted in an airflow stream such as a pipe, duct or stack. As particulate flows near and over the sensing element, minute electrical currents are induced in the sensor and transferred to the control unit by a coaxial cable. A microprocessor filters and processes the signal into a normalized, absolute output that is linear to the mass concentration of particulate. The BM-30 LGX is CE conformant, CSA certified (optional) and complies with EN 61010, safety requirements for electrical equipment for measurement, control and laboratory use applications.

Simple, Rugged & Maintenance-Free

The control unit – which includes the electronics – is housed in a rugged, cast aluminum enclosure. A LCD displays particulate levels in bar-graph and digital forms. A lockable membrane keypad is provided for setup and adjustment of parameters. Two (2) relay contact outputs are standard; an isolated 4-20 mA output is optional. The particulate sensor is very durable and virtually maintenance-free. The sensor is passive with no active circuits, to ensure high reliability and durability. It does not require special alignment and is not affected by normal vibration. The cable that connects the particulate sensor to the control unit is a high-quality coaxial cable specifically designed for the BM-30 LGX system. The maximum cable length is 300 feet/91 meters making it ideal for a wide variety of installations.

Examples of Industries Needing Particulate Monitoring	
Cement	Minerals
Foundry	Power
Steel	Wood
Chemical	Aluminum
Carbon Black	Food Processing
Grain	Coal
Pharmaceutical	Incineration

BM-30 LGX
Particulate Monitor

BINMASTER®

BM-30 LGX Particulate Monitor Benefits

- **Early detection:** detects broken bags and prevents cross contamination of materials
- **Scheduled maintenance:** prevents unforeseen downtime and expensive equipment repairs
- **Regulatory compliance:** detects leaks before they become visible, monitors air quality and helps companies meet EPA regulations
- **Plug & play:** simply set the desired alarm level that will trigger an alert
- **Reliable operation:** dust coating on sensor will not affect signal or trigger false alarms
- **Improved safety:** available in CSA approved Intrinsically Safe version for hazardous area applications
- **Loss control:** provides essential monitoring and control to prevent the loss of valuable powders, such as expensive pharmaceuticals and chemicals
- **Protect and prolong equipment life:** excessive dust can damage equipment such as expensive vacuum pumps, blowers, turbines, and catalytic filters

Specifications

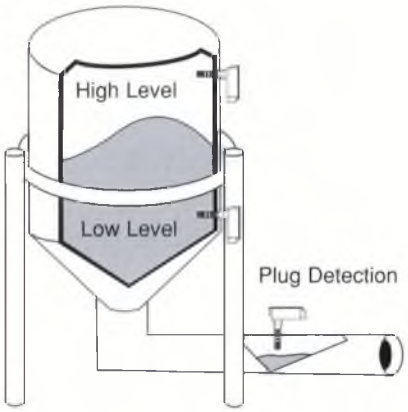
CONTROL UNIT	
Power supply	115/230VAC 50/60Hz Standard, (6 Watts max) 24VDC Optional
Resolution (Range)	5.0pA (0 to 5000pA) Standard, 0.5pA (0 to 5000.0pA) Optional
Outputs	2 Relay (SPST 5A@240VAC) Standard, 1 Isolated 4-20mA Optional
Enclosure	NEMA 4X Aluminum Standard, Other Optional
Temperature	-13°F (-25°C) to 160°F (70°C)
User Interface	LCD with digital, analog & text display, 4-button membrane keypad
Area Classification	Ordinary locations (CE Approved) Standard Ordinary locations (CSA Approved for use with Class I, II, III sensor) Optional
General	Circuit boards conformal coated for long life in harsh environments
SENSOR	
Housing	NEMA 4X Aluminum Standard
Probe Lengths	3", 5", 10", 15", 20", 30", 36" (Approximately ½" duct/pipe I.D.) Extended nipples & rope sensors for large multi-compartment baghouses
Mounting	NPT, Tri-Clamp or Flange
Wetted Materials	316SS and Teflon or Ceramic Standard, Hastelloy Optional
Process Temperature	-40°F (-40°C) to 250°F (120°C) Standard, 450°F (232°C) Optional, 800° to 1600°F Optional
Process Pressure	10PSI (0.69bar) Standard, 100PSI (6.9bar) Optional, 1000PSI (69bar) Optional
Sensor Cable	300' (100m) Maximum
Area Classification	Ordinary locations (CE Approved) Standard Class I, II, III, Div I, II, All Groups (Intrinsically Safe, CSA Approved) Optional
General	No special alignment, not affected by normal vibration
APPLICATION RANGE	
Particulate	Any type >0.3 micron - Conductive, non-conductive, moist, corrosive
Minimum Detection Level	With 5.0pA resolution - Approx. 5-10mg/m3 (standard leak detection) With 0.5pA resolution - Approx. 0.5mg/m3 (monitoring & analysis)

BINMASTER

Taking Control...To A Higher Level

CompactPro

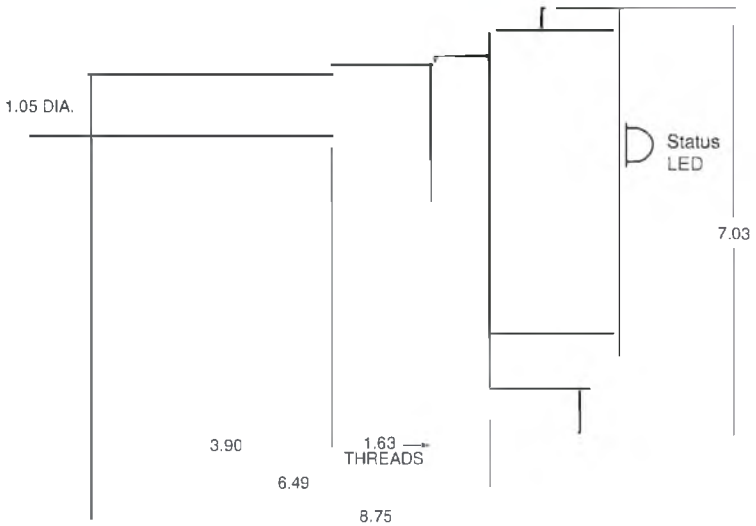
Compact Capacitance Probe For Reliable Level Measurement and Plug Chute Detection in Liquid, Powder, Granular, and Pelletized Materials



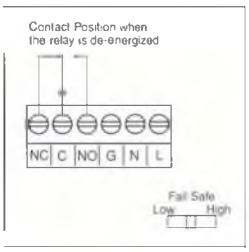
- Works Where Proximity Switches Don't
- For Tanks, Bins, Silos, Chutes, Conveyors, Pipes, and Load Out Hoppers
- ProShield Feature Ignores Material Buildup
- LED on Housing Indicates Sensor Status
- Easy "One-Time" Calibration
- Compact Design; Simple To Install
- For Metal, Plastic or Other Non-Metallic Vessels

Eliminate Proximity Switch Failures with Reliable Compact*Pro* Technology

Introducing BinMaster's **Compact*Pro***: a compact capacitance probe for use in solid, liquid and slurry applications. **Compact*Pro*** provides reliable point level measurement in materials where proximity switches don't work. Special ProShield technology ignores the material build-up that causes proximity switches to fail. For use in metal, plastic or other non-metallic tanks and vessels. **Compact*Pro*** is simple to install and features easy "one-time" calibration. Economically priced, **Compact*Pro*** offers the same features found in more expensive capacitance probe sensors.



Wiring Diagram



Compact*Pro* Features

- ProShield® technology ignores material build-up on the vessel sidewall or along the probe assembly for more reliable operation.
- Specifically designed electronics provide highly sensitive measurement detection (requires less than a 1 picofarad shift from ambient).
- Visual LED on housing indicates sensor status.
- Simple "one-time" calibration procedure.
- Operation is not affected by changes in temperature—eliminates the need for bothersome re-calibration.
- Four levels of static discharge protection—important for pneumatically conveyed materials.
- 1 - 30 second time delay.
- Simple to install; no routine maintenance.
- 5 Amp, SPDT fail- safe relay output (switch selectable high/low fail safe).
- Operation is independent of bin wall, for use in metal or non-metallic vessels.

Specifications

Power Requirements:	120 VAC 1.5 VA
Output Relay:	SPDT 5 amp at 250 VAC
Temperature	
Electronics:	-40 to 185° F (-40 to 85° C)
Probe:	-40 to 240° F (-40 to 116° C)
Enclosure:	NEMA 4X, Dust Tight, Water Resistant
Sensitivity Setting:	Adjustable sensitivity to <1 Picofarad
Calibration:	Multi-turn Potentiometer
Fail-Safe:	Switch Selectable, High/Low
Time Delay:	Adjustable 1 to 30 Seconds
Enclosure:	PVC
Probe:	CPVC
Mounting:	1" NPS (1¼" NPT Adapter available)
LED:	Indicates Material Presence or Absence

CROP-PROTECTOR™

Advanced Digital Solutions to Monitor and Control Stored Grain Conditions

BINMASTER®

Advanced Digital Solutions to Monitor and Control Stored Grain Conditions

The BinMaster Crop-Protector™ suite of products offers a complete solution for monitoring temperature, moisture, and spoilage prevention using advanced digital technology and automated controls to optimize the condition of grain stored in silos, flat storage warehouses, and piles. Crop-Protector™ technology was developed by iGrain of Denmark and has been proven to perform in Europe, Asia, and Africa since 2008. BinMaster brings this advanced technology and our grain industry expertise to the North and South American markets and will manufacture, sell, and service the Crop-Protector™ product line from its 75,000 square foot ISO 9001:2008 certified facility in Lincoln, Nebraska, USA.

TEMPERATURE MONITORING

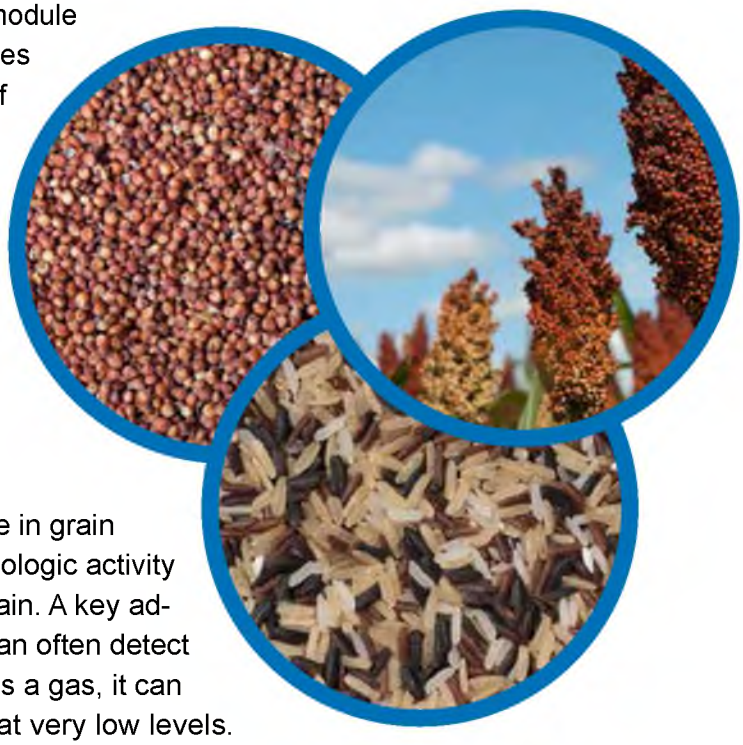
Crop-Protector™ temperature cables use advanced digital sensors encased in a rugged polymer cable equipped with fittings we machine in our Binmaster factory. This digital technology is proven to be highly accurate with a long service life, resulting in lower maintenance, higher reliability, and lower total cost of ownership than other types of temperature cables. Data from the temperature cables can be sent to a desktop or laptop PC or a wall-mounted touch PC loaded with Crop-Protector™ software. It is also possible to connect to a PLC or SCADA system, or a compact handheld reader. Temperature lances are another alternative for temperature monitoring using the same advanced digital sensor packaged in a compact spear. As they are highly portable, temperature lances can be used in flat storage warehouses or piles, or for checking smaller storage sites. The lances are simply inserted into the grain, and the temperature data is sent to a handheld reader. Up to 20 lances can be connected in one local network using just a single handheld reader for data collection from all sensors.

MOISTURE MONITORING

Crop-Protector™ digital moisture sensing cables measure ambient relative humidity at several points in the grain bin and use the data to calculate grain moisture using the EMC curve (Equilibrium Moisture Concentration). In most silos, a single moisture cable is all that is needed to monitor grain moisture content. Accurate, digital moisture measurement helps control losses due to spoilage that can occur if excessive moisture is present, or shrinkage due to moisture loss caused by excessive aeration.

AERATION CONTROL

Crop-Protector™ software offers an Aeration Control module that uses the data from temperature and moisture cables to determine when, and for how long, aeration and roof exhaust fans should be run to optimize grain moisture content. A weather station is integrated into the system to supply ambient temperature and relative humidity conditions, with that information used to determine when to stop or start the aeration or roof vent fans. (We don't sell the fans, just the controls!)



SPOILAGE DETECTION

The Crop-Protector™ Grain Sniffer™ detects spoilage in grain by monitoring the level of CO_2 in the silo caused by biologic activity that is a result of insect infestation or fungus in the grain. A key advantage to the Grain Sniffer™ CO_2 monitor is that it can often detect spoilage faster than temperature monitoring. As CO_2 is a gas, it can travel through the grain mass, and can be detected at very low levels. Early detection of spoilage increases the operational options to prevent losses, such as reducing the need for blending or moving grain from one bin to the other, saving time, money, and protecting the value of the crop.

COMPLETE SYSTEMS & CUSTOMER SERVICE

BinMaster will work with you to meet the requirements of each facility and recommend a custom solution using the modular components of the Crop-Protector™ system. At BinMaster, Crop-Protector™ isn't just a product line. It's a complete grain monitoring solution that is made, sold, and serviced by us right here in the Heartland of America.

MADE IN USA

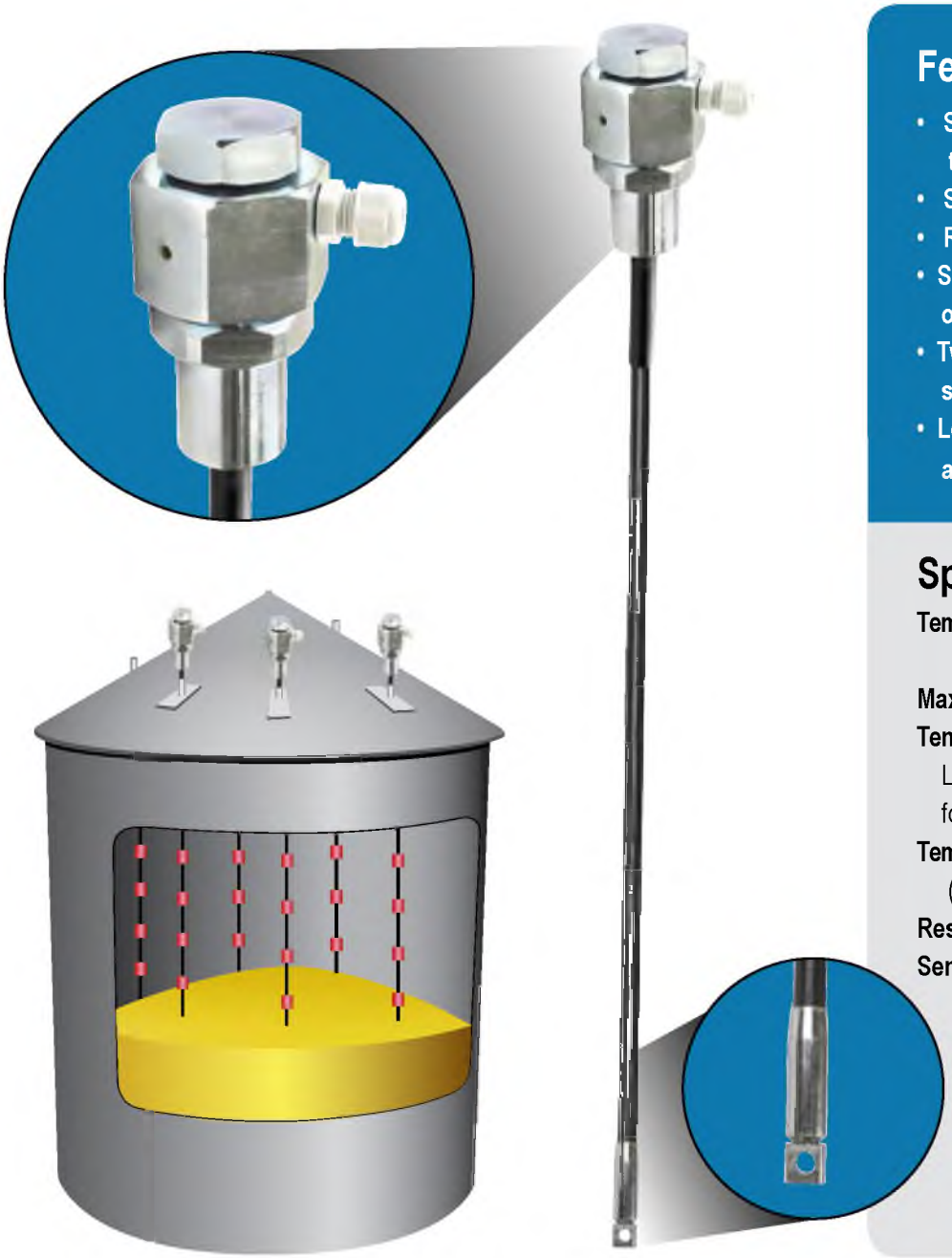
Lincoln, NE
USA

CROP-PROTECTOR™

Temperature Sensor Cable

Advanced Digital Grain Temperature Monitoring

The Crop-Protector™ digital sensor cable offers precise temperature monitoring and long-lasting durability. Advanced digital sensors are encased in a rugged cable and suspended from the roof of steel or concrete grain silos. The cables are easily installed from inside the roof using a suspension hook or steel wires or from outside the roof using a mounting plate. Cable length is set so the cable clears the bin sweep auger. These temperature cables are designed to be maintenance-free and accurate over a long life of service.



Features

- Superior, long-lasting, and precise digital technology
- Special "low-pull" polymer cable
- Reliable operation with no temperature drift
- Simple installation via a variety of suspension options
- Two-wire system reduces wiring costs and simplifies installation
- Long service life that reduces maintenance and total cost of ownership

Specifications

Temperature Sensor Cable Diameter: Ø.42 in. (10.8mm)
Maximum Cable Length: 98 ft. (30m)
Tensile Strength: 5,511 lb. (2.500 Kg)
Longer cables of larger diameter available for custom ordering
Temperature Range: -4°F to 158°F (-20°C to +70°C)
Resolution: 0.5°F (0.3°C)
Sensor Placement: 6 ft. (1.8m) and 10 ft. (3.05m) standard
Sensors per Cable: Up to 99
Silo Roof Mounting: Hook, steel wire or mounting plate
Silo Floor Attachment: Hook eye for floor attachment

BINMASTER®

CROP-PROTECTOR™

Sensor Cable Suspension Systems

Mounting Systems for All Types of Applications

Suspension Hooks

Suspension hooks are used when cables are mounted inside the silo and require access to the silo roof from inside the silo for installation. These heavy duty suspension hooks are designed for simple installation and long-lasting durability. Self-locking bolts secure the hook to the sensor to ensure that the bolts never loosen and the cable stays put. The hook can be mounted through an existing opening in the rafter. Several silo manufacturers provide a standard fitting for cable sensor mounting. Alternatively, a hole can be drilled through the rafter, if required.

Features

- Used for mounting cables from inside the silo
- Simple installation, long-lasting durability
- Self-locking bolt ensures permanent stability
- Install into an existing or drilled hole

Roof Mounting Plates

Roof mounting plates allow rooftop access to the sensor cable, allowing it to be installed, wired, and serviced from outside the silo. The mounting plate kit comes complete with sealant, self-tapping screws, a template for cutting the hole, and mounting instructions. Nine mounting screws provide a strong attachment to the roof sheets and spread the pulling force of the roof plate to adjacent roof sheets for added strength and stability. Mounting plates may also be mounted near the overlap junction of two roof sheets, displacing the pulling force to both roof sheets. For very large or tall silos, the mounting plate may also be mounted in the middle of the sheet using a one or three-bar support system.

Features

- Allow installation, wiring and service from outside the silo
- Designed to spread pull force to adjacent roof plates
- Nine mounting bolts provide strength and stability
- Sealant, bolts, template, and instructions included in kit

BINMASTER®

CROP-PROTECTOR™

Temperature Sensor Lance

Spot Checking or Permanent Pile and Flat Storage Monitoring

The sensor lance is a rugged spear used to monitor the temperature of grain in piles, flat storage warehouses, or is easily portable to any location where temperature readings are needed. Digital sensors are encased in a flexible fiberglass rod that has a super smooth surface for easy insertion into the grain. The lance has a rugged handle with a substantial grip for ease of use. The lance connects to a portable handheld reader where readings can be viewed for up to 20 lances. The data can be transferred to a PC where Crop-Protector™ Manager software can generate historical trend reports for each sensor.

Features

- Precise portable or permanent digital temperature monitoring
- For piles, flat storage warehouses or remote locations
- Rugged handle and flexible fiberglass rod in a variety of lengths
- Outputs to handheld device with optional download to PC
- Up to 20 lances in a single network for large storage facilities

Specifications

Sensor Lances

Lance Length	Number of Sensors
3 ft.	1
13 ft.	3
25 ft.	5

Temperature Range: -4°F to 158°F (-20°C to +70°C)
Resolution: 0.5°F (0.3°C)
Sensors per Network: Up to 20
Lance-to-Lance Connection Cables: 20 ft., 40 ft., 60 ft.
Lance-to-Handheld Reader: 3 ft. or 15 ft.

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Weather Station

Quick Response Weather Monitoring for Aeration Control

The weather station provides fast, reliable information about the ambient temperature and air moisture conditions used for efficient aeration control. This information is integrated with the complex Automatic Aeration Control software that turns aeration fans on or off to optimize the moisture content of grain. Weather conditions such as rain starting or stopping, near freezing conditions, sunrise, and sunset, conditions are influential in determining when aeration should be applied. These conditions, along with ambient humidity relative to the moisture in stored grain, determine when and for how long aeration should be used to maximize the value of grain for market. The weather station is designed for long-lasting durability and is suitable for harsh conditions such as long, cold winters, hot tropical or desert-like conditions.

Weather Station Pro

Weather Station LC

Weather Station

AMBIENT AIR CONDITION

80°F | 61.8 rH

Last 24 Hours Hi/Lo

T Hi:	90°F	rH Hi:	80%
T Low:	46°F	rH Low:	36%

Latest Reading: 15/07/2015 10:06:00

Status: OK

Features

- Highly accurate, ambient weather information used for aeration control
- Connects to Automatic Aeration Control software to optimize grain moisture content
- Durable, long-lasting construction designed for minimal maintenance
- Suitable for cold winters, hot summers, and tropical or desert climates
- Remote access to weather conditions from Crop-Protector™ Manager software

Specifications

Power: Via Master-Hub

Communication: Data-bus to Master Hub

Relative Humidity Measurement Range: 2% to 99% rH, non-condensing

Temperature Measurement Range: -22°F to 158°F (-30°C to +70°C)

Weather Shields: Sun, rain and snow protection

BINMASTER®

CROP-PROTECTOR™

Moisture Sensor Cable

Digital Grain and Air Moisture Monitoring

The moisture sensor cable is used to monitor the ambient relative humidity at two to four different sensor points in the grain bin. The relative humidity is used to calculate grain moisture content using the EMC curve (Equilibrium Moisture Concentration).The top sensor is located just under the silo roof to monitor the relative humidity in the head space. The data from this sensor is used in the Crop-Protector™ Manager software to control the operation of roof vent fans. Two other moisture sensors are located at high and low levels along the cable to detect the moisture level present in the grain. The data from these sensors is used to turn on the aeration fans only when needed to minimize shrinkage due to loss of moisture content. This Crop-Protector™ Aeration Control software also shows the moisture content of the grain over time and displays the information on a trend curve.

Features

- Helps avoid shrinkage via reliable, digital moisture monitoring
- Control exhaust fan operation by monitoring humidity in head space
- Initiate aeration only when absolutely needed to prevent shrinkage
- Monitoring of grain and silo moisture conditions using easy-to-use PC software
- For use in all types of grain by simply changing software parameters

Specifications

Communication: Sub-Hubs collect data from moisture cables. Master-Hubs collect data from Sub-Hubs and send it to the Crop-Protector™ Manager software on a PC.

Moisture Sensor Cable Diameter: Ø.42 in. (10.8mm)

Maximum Cable Length: 78 ft. (24m)

Tensile Strength: 4,409 lb. (2.000 Kg)

Sensors per Cable: 1 to 4

Cable Anchoring: Optional attachment eye available

Grain Moisture Sensing Range: 8% to 24%

Head Space Moisture Sensing Range: 2% to 99% rH

BINMASTER®

CROP-PROTECTOR™

Handheld Temperature Reader

Portable Monitoring of Temperature Data with Logging

The handheld reader is a low cost, convenient device that allows you to read and collect data from temperature sensor cables or sensor lances. Each sensor cable or lance is connected in a sequential series and assigned a location number. Temperatures are read automatically, and displayed by simply scrolling through each sensor location and viewing the temperature data for each sensor. The handheld reader comes in a handy carrying case with accessories including a USB cable for charging the unit, a universal connector cable that works with either temperature cables or lances, and a flashlight. Data can be automatically transferred data to a PC using the software on the memory stick included in the kit.

Features

- Portable monitoring of data from temperature sensor cables or sensor lances
- Handy carrying case complete with USB charging cable, connector cable and flashlight
- Scroll with arrows between sensor cables/lances (LR arrow) and individual sensors (UD arrow)
- Includes memory stick for data transfer to PC software
- Matrix view with trend data can indicate development of hot spots

Specifications

Model	2500-PC
Maximum # of Cables	20
Maximum # of Temperature Sensors	600
Memory Data Transfer to PC	Yes
Matrix View with Trend Data	Yes

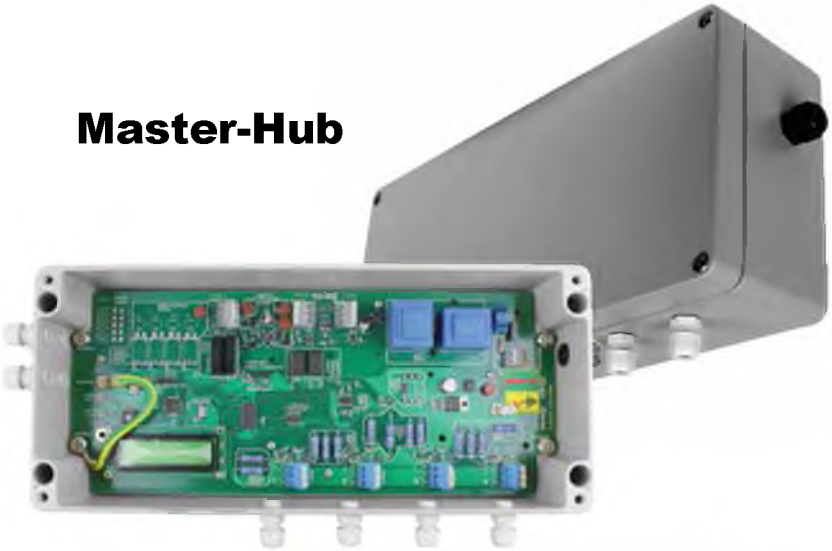
BINMASTER®

Communications Boxes

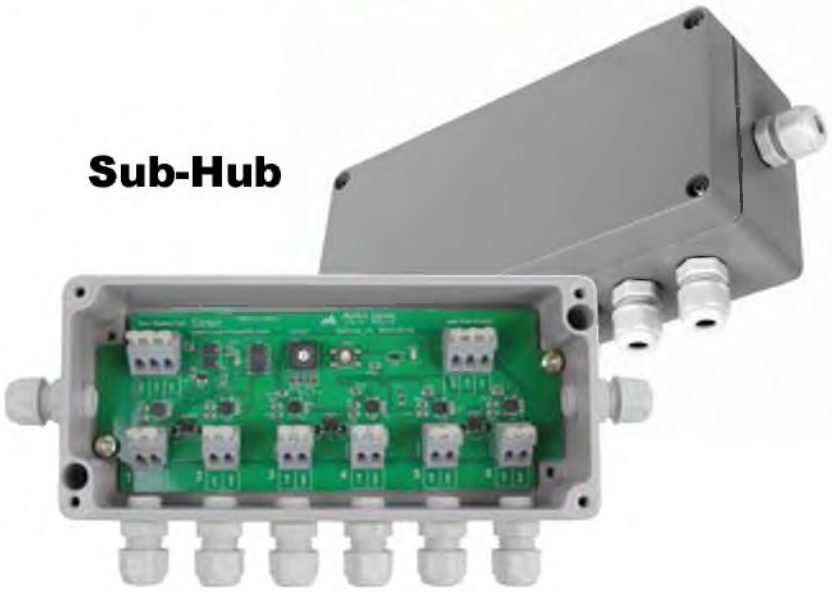
Digital Data Transfer via Master-Hubs and Sub-Hubs

The Master-Hub and Sub-Hub are wiring boxes used to collect data from digital temperature or moisture cables and send it to the Crop-Protector™ software. Use of these rugged boxes enables modular system design that is scalable for both small and large grain storage operations. The Sub-Hub has 6 inputs for temperature or moisture cables, while the Master-Hub can connect to a maximum of 32 Sub-Hubs. The Master-Hub features a built-in display that continuously shows the numbers of Sub-Hubs, sensor cables, and sensors connected to it. The Master-Hub design allows the system to be commissioned, monitored, and serviced without connecting to a PC, if that is necessary. Most operations choose to interface their system with the Crop-Protector™ Dashboard Manager on a PC or in the Cloud.

Master-Hub



Sub-Hub



Features

- Transfers data from temperature or moisture cables to Crop-Protector™ software
- Modular design is highly scalable for small and large grain storage operations
- Sub-Hub features 6 inputs for temperature or moisture cables
- System allows for up to 32 Sub-Hubs connected to each Master-Hub
- Master-Hub has digital display showing number of Sub-Hubs, sensor cables, and sensors
- System interfaces with Crop-Protector™ Dashboard Manager software on a PC or in the Cloud

Specifications

Sub-Hub:

Up to 6 inputs from temperature or moisture sensor cables

Data sent to Master-Hub via Crop-Protector™ data-bus

Built-in power indicator for simple system check

Master-Hub:

4 input ports from up to 32 sub-Hubs (192 sensor cables)

Each Master-Hub can communicate with up to 4,000 sensors

Master-Hub can be used in series of up to 99 units

RS-485 Modbus communication with PC or the Cloud

BINMASTER®

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CROP-PROTECTOR™

Relay Output Unit

The relay output unit is a control device used for automated control of aeration fans in the Crop-Protector™ system. The units are controlled via the Aeration Control software that uses moisture sensor data to determine when and for how long an aeration fan should run to optimize grain moisture content. Each unit has 8 relays with the relay status of open or closed visible on the diodes. Every unit has an individual Modbus address and can be installed where the aeration fans have their power start/stop relays to minimize wiring. One relay will normally control all of the aeration fans for a single bin, allowing for up to eight bins to be controlled via a single relay box. The relay output unit can also be used to control head space ventilation fans, either directly or via a help-relay. Data output (via RS-485 Modbus) directly to a PLC is also available.

Features

- Control device used for automated control of aeration fans and roof ventilation
- Unit has 8 relays with each relay's status visible on the diodes
- Crop-Protector™ Aeration Control software indicates need for aeration
- Manual or automated fan operation via RS-485 Modbus
- Status can be monitored via Aeration Control software on a PC or via the Cloud

Specifications

Communication: Via RS-485 Modbus to Crop-Protector™ Dashboard

Operation: Automatic or semi-automatic mode as determined in Aeration Control software

DIN Rail Unit:

8 relays with normally open (NO) and normally closed (NC) contacts

Maximum switching power 12 – 24 VDC: 3A and 230 VAC: 10A

12 VDC, 600 mA power supply

Modbus protocol, addressed from 01 to 99 using Crop-Protector™ software

RS-485; up to 99 relay units in series, up to 3,937 ft. (1200m) on CAT-5e cable

Cabinet Unit:

Class IP-65 die-cast aluminum box 6.7 in. x 9.45 in. x 3.15 in. (170mm x 240mm x 80mm)

100 – 240 VAC power supply, maximum 10 w with power on indicator

BINMASTER®

CROP-PROTECTOR™

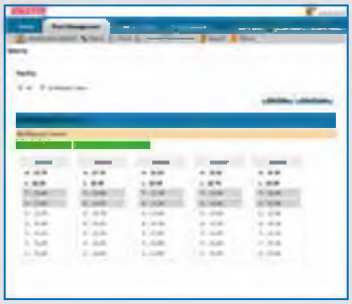
Crop-Protector™ Dashboard Manager Software

A Comprehensive Overview of Grain Storage and Monitoring Data

The Crop-Protector™ Dashboard Manager is the software platform that provides a comprehensive overview of all grain storage and monitoring data. The home page of the Dashboard provides an at-a-glance summary of stored grain conditions and control data. Dependent on the configuration of the system, the Dashboard will show grain temperature, grain moisture, weather data, approximate grain level, volume and weight, aeration fan and roof exhaust fan off or on status, and spoilage indication from the CO_2 sensor. More detail about each condition can be shown in detail by selecting from a sub-menu that includes options such as trend data, matrix view, inventory trend, alarm settings, fan status, and spoilage indication. The Crop-Protector™ Dashboard Manager is an easy-to-use tool that makes the lives of grain managers easy and safe.

TREND DATA

The trend data chart displays the highest and lowest temperature reading in each silo and the average temperature from all sensors.



MATRIX VIEW

The matrix view displays all of the temperatures for each sensor in each sensor cable, as well as a high (H) and low (L).

BINMASTER®

Single Device Emissions Monitoring

The Dust Detect 1000 is a single device dust detector that has been specifically designed to continuously monitor the flow of particulate emissions from small stacks or other emission points being passed through a filter within an air filtration system. It easily installs in the exhaust ductwork and can be used in conjunction with various types of bag, ceramic, cartridge or cyclone filters. The probe on the Dust Detect 1000 is designed to recognize abnormal particulate levels outside user-defined preset parameters and initiates an alarm when changes in emission exceed these levels.

Alerts to Dust Levels Outside of Preset Standards

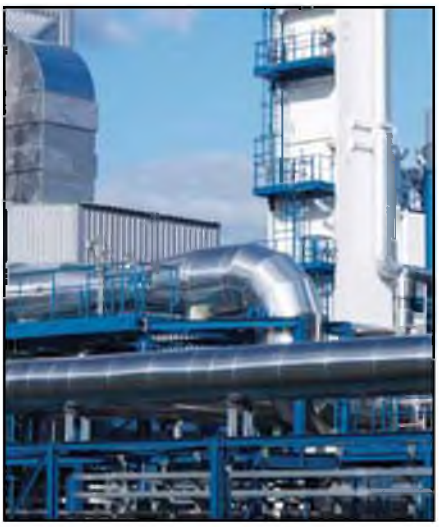
The Dust Detect 1000 measures particulate emission levels using a logarithmic scale against the set reference point, which is established by averaging the level of emissions for a given environment. It activates an alarm which is "switch selectable" and can be set for either an instantaneous reading or one-minute averaged level reading. By averaging the emission readings, the Dust Detect 1000 eliminates false readings commonly found with other dust monitoring systems that smooth readings. This device also provides a pre-warning alarm which alerts to potentially hazardous situations.

Makes the Workplace Safer and More Efficient

The Dust Detect 1000 helps to prevent the loss of valuable product and dramatically improves the safety of the workplace by alerting personnel to changes in emission levels before they become serious, which can virtually eliminate emission-related shutdowns. The device is simple to use, yet feature rich, making the Dust Detect 1000 a highly accurate and dependable dust monitoring system.

Dust Detect 1000

BINMASTER®



Single Piece Triboelectric Dust Detector

Dust Detect 1000 utilizes triboelectric technology, whereby the collision and interaction of particles with the probe rod causes a small electrical charge transfer to occur. This small electrical charge provides a signal that is monitored by the electronics in the device. It is designed to prevent false readings, even if an accumulation of dust forms on the sensor rod. Emissions readings are averaged, not smoothed, to eliminate false alarms. It can be set to make pre-warning indicator alerts to potentially hazardous situations or be set to provide an instantaneous alarm or one-minute averaged readings. BinMaster offers a 4-20 mA output for applications where Dust Detect 1000 will be used with a PLC.

Dust Detect 1000 Specifications

Enclosure	Die cast aluminum, FDA recognized powder coat finish
Power Requirement	115 VAC, 230 VAC optional, 60/50 Hz
Operating Temperature	-25° to +160°F (-32° to +71°C)
Stack Temperature	250°F (107°C)
Conduit Connection	3/4" NPT
Process Connection	1-1/4" NPT
Output	Two SPDT 5A relays (warning & alarm)
Alarm	Dual alarm (alarm is 2x pre-alarm), switch selectable for instantaneous or one-minute average
Sensitivity	1 mg/m (.0005 gr/SCF)
Sensor Rod	316 stainless steel – 3", 6" & 12" standard, 1.5"-36" custom lengths available

Specifications subject to change without notice

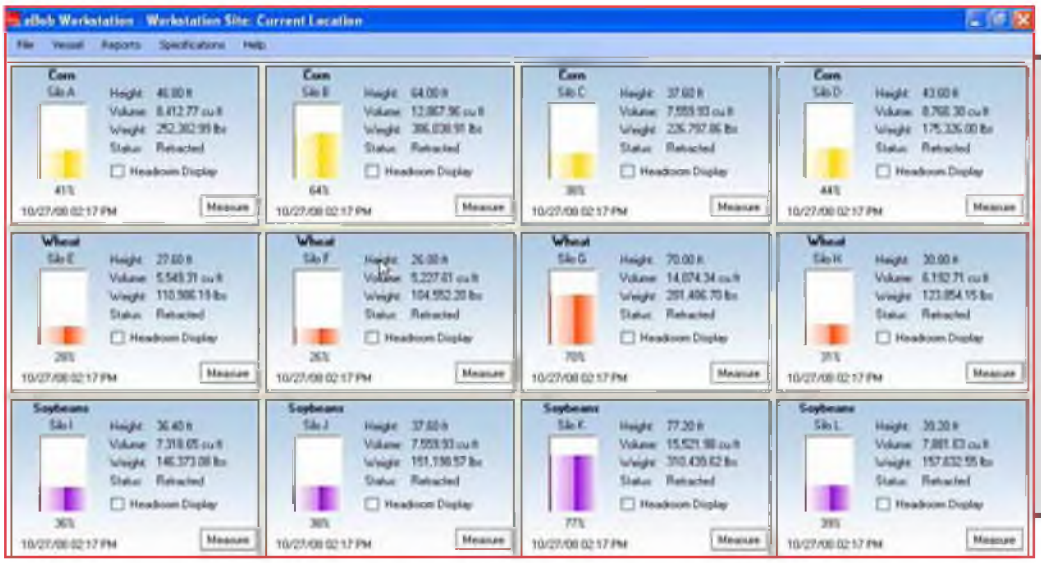
Monitors Emissions in Dusty Conditions

The Dust Detect 1000 installs easily in the exhaust duct of an air filtration system, with either a 3/4" or a 1-1/4" NPT mount. Some common applications include monitoring conditions during the processing or manufacturing of:

Ferrous Metals	Feed/Grain Milling	Chemicals
Non-Ferrous Metals	Food Processing	Pharmaceuticals
Cement/Aggregates	Wood Processing	Plastics
Mining/Minerals	Pulp/Paper	Rubber Compounding
Foundries	Tobacco Processing	Battery Manufacturing
Fertilizer	Textiles	Galvanizing

Real-Time Data for Intelligent Inventory Management

- Windows XP Pro, Vista Business and Windows 7 compatible – simple setup and operation
- View data for an individual vessel, a select group of vessels, or all vessels
- Activate instant readings or program automatic measurements
- Set programmable alarms for high / low levels or "time to replenish"
- Automated email for alarm notifications; email detailed bin inventories at scheduled times
- Network and wireless options available for sensor communications



Colorful "at a glance" graphical monitoring for one to 100 vessels

eBob Inventory Management Software is designed to help users gather real-time inventory data from storage vessels. The eBob program works in conjunction with BinMaster SmartBob2 remote level sensors to provide measurement data to a personal computer. This bin measurement monitoring solution collects data from up to 100 vessels and allows for data to be viewed via LAN network connections by authorized users. eBob software generates reports that can be used to increase operational efficiency and provide valuable real-time and historical data used for effective decision making.

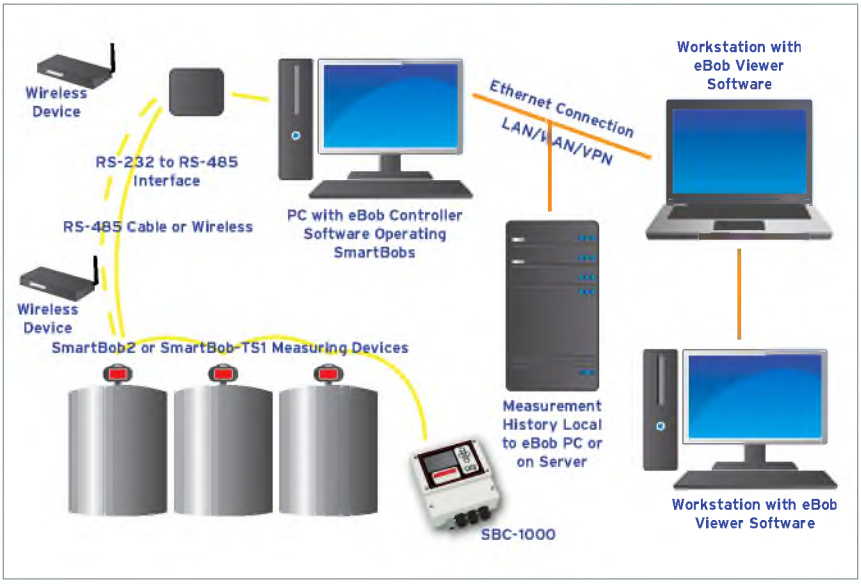
eBob software helps customers more effectively manage vessel levels without having to manually inspect and measure each vessel, saving valuable time while optimizing vessel levels and storage capacity. It provides for highly affordable inventory tracking for any size of operation using computer-based technology to provide detailed information. Instead of "making rounds" to perform readings, customers can log on to a personal computer, log-in using their unique password, and then view real-time data on their vessels. It is easy to use and requires no special training or support.

eBob Inventory Management Software

BINMASTER®

Harness the Power of eBob

- A dedicated PC is set up to function as the eBob host/controller PC, and is connected to SmartBob2 sensors using RS-485 communications or wireless modems.
- The host/controller PC is connected to a LAN, WAN or VPN to allow access by other computers on the same network.
- The measurement history and all system parameters are stored in a SQL database, either locally on the host PC or on a corporate server.
- eBob Viewer software can be installed on other PCs on the network and access the SQL database via the network to view measurement data and system parameters.



eBob improves efficiency and safety

eBob software saves customers valuable time and hence – helps to control costs. The ability to monitor vessel levels remotely eliminates the need for personnel to manually visit each site to read vessel levels. Plus, sharing data in real time enhances communication between personnel and enables them to make informed decisions. The reports generated by eBob provide "information at a glance," while also documenting a valuable historical record.

eBob manages critical inventory data

- Vessel name, number and content
- Distance to product (headroom)
- Product volume and weight
- Percentage full
- Date and time of last measurement
- Measurement device status – descending, retracted, inactive
- Measure button to activate a new measurement
- Headroom checkbox to calculate remaining volume

- Monitor vessel levels in real time to help optimize vessel levels for maximum storage capacity
- Share information with managers or vendors at multiple locations simultaneously, providing better information for decision making
- Cost-effective as it requires minimal manpower, no third party applications and no monthly access fees
- No need to continually and manually take vessel measurements – no climbing to the top of vessels to make visual readings of levels

Flow / No Flow Detection for Solids & Powders

The BinMaster flow detect system consists of two components - the FDS 1000 Remote Sensor Probe which is mounted in a pneumatic pipeline, gravity chute or feeder - and the FDC 1000 Control Console which is mounted in an area accessible for users to read the console during operations. The system promotes continuous and efficient operations by informing users that solid or powder materials are flowing and alerts them if the flow status has changed, power has been lost, or if communication between the Remote Sensor Probe and the Control Console has been interrupted.

Reliable Doppler Technology

The FDS 1000 Remote Sensor Probe is a high quality, industrial grade instrument that senses flow / no-flow conditions using Doppler technology (microwave) to provide highly reliable and sensitive motion detection. It works by transmitting a low energy signal through a Teflon process seal into the material flow stream. A portion of the signal is reflected back to the sensor, with the movement of material causing a frequency shift - called the Doppler shift - which is used by the sensor to detect material flow.

Convenient LED Readout

The FDC 1000 Control offers a user-friendly, four LED readout indicating flow, power, loop fault and alarm status…plus separate time delay adjustments for both flow and no flow conditions. It is equipped with self-monitoring features including a switch selectable, fail-safe alert that will indicate an alarm condition if the unit loses power. The loop fault indicator notifies the user to a loss of communication between the Remote Sensor Probe and Control Console, preventing false or incorrect readings. For added convenience, all control settings are made from the Control Console, not the Remote Sensor Probe - with a single-turn potentiometer allowing for quick and easy sensitivity calibration.

Flow Detect 1000

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Flow Detect 1000 for Efficient Operations

- Solid-state Remote Sensor Probe is virtually unaffected by humidity, ambient light, pressure, vacuum, temperature, noise, electrical signals, non-metallic buildup or dust
- Intrinsically safe, explosion-proof design enhances safety and is suitable for a wide variety of industries, materials and operating environments
- Reliable Doppler technology provides highly accurate and dependable readings compared to mechanical, triboelectric or ultrasonic methods
- Senses material flow in challenging industrial environments and through non-metallic surfaces such as plastic, wood and glass
- Non-intrusive flush mounting and non-contact operation avoids contact with the flow stream, eliminating flow stream interference and equipment wear that can occur with other flow detection technologies
- LED readouts on the Control Console are easily accessible to users, providing flow, loop fault and power information as well as an alarm alerting to loss of power
- Single-turn sensitivity calibration and other control settings are done from the Control Console without needing to access the Remote Sensor Probe

FDS 1000 Remote Sensor Probe Specifications

Enclosure	Die cast aluminum, FDA recognized powder coat finish
Power Requirement	Provided by FDC 1000 Control Console, low voltage
Operating Temperature	-22° to +158°F (-30° to + 70°C)
Maximum Process Temperature	+250°F (+121°C) if ambient air temperature is below +150°F (+65°C)
Process Seal	TFE Teflon
Process Connection	1¼" NPS (flush mount with half coupling)
Conduit Connection	¾" NPT
Detection Range	Up to 10', depending on target
Interconnect Wiring	5 conductor cable to FDC 1000 Control Console
Indicators	Green LED - Power, Red LED - Loop Current
Emission	24.125 GHz, less that 1mW/cm^2 (OSHA limit is 10mW/cm^2)
Approvals	Intrinsically safe when connected to FDC 1000 Control Console - Class II, Groups E, F, & G, FCC Part 15 Certification

FDC 1000 Control Console Specifications

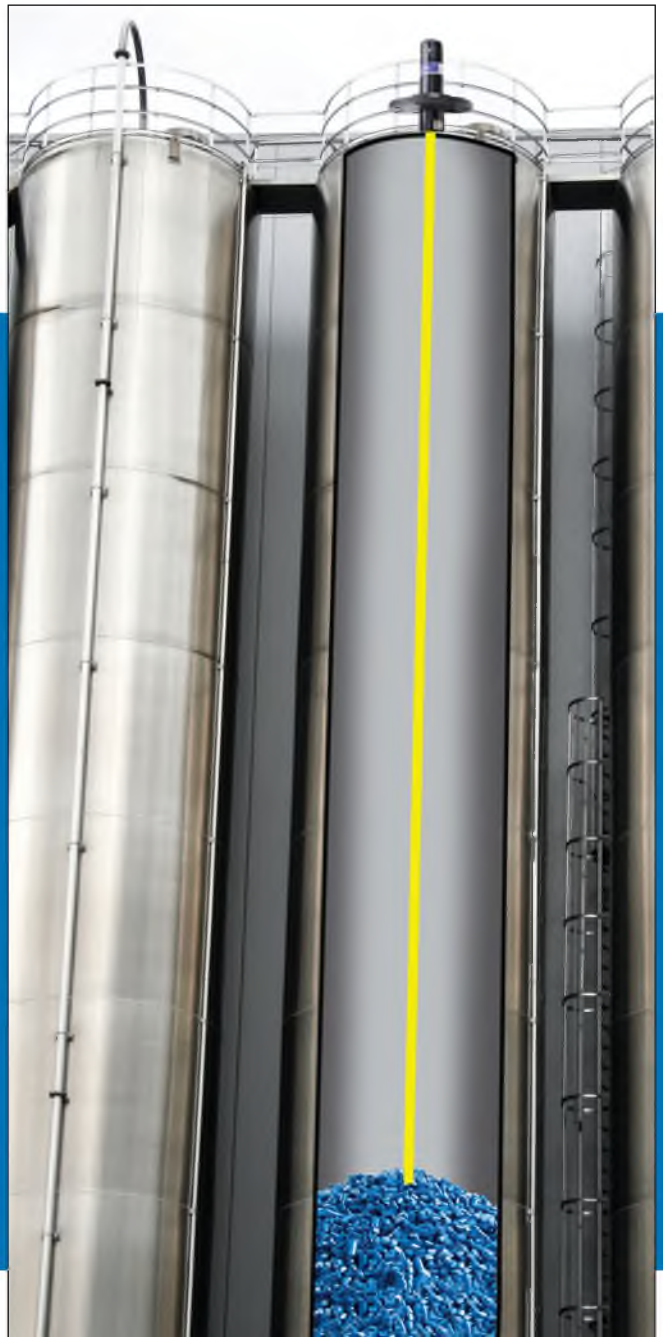
Enclosure	8" x 6" x 4" fiberglass, NEMA 4X, 12, 13 flange mount
Power Requirement	115 VAC, 60/50 Hz, 5VA (230 VAC available)
Operating Temperature	-31° to +158°F (-35° to + 70°C)
Output	DPDT dry contacts, 5A @ 240 VAC, or 30 VDC
Indicators	Green LED - Power, Red LED - Loop Fault, Yellow LED - Sense Flow Red LED - Alarm
Interconnect Wiring	5 conductor cable to FDS 1000 Sensor Probe, intrinsically safe
Alarm Fail-Safe	Switch selectable FLOW or NO FLOW
Time Delay	FLOW delay, single turn, 0.1 - 15 seconds NO FLOW delay, single turn, 0.1 - 15 seconds
Sensitivity Adjustment	High / low selectable, single-turn adjustment
Approvals	Ordinary locations, industrial control equipment, intrinsically safe output to FDS 1000 Sensor Probe

Laser Level Transmitter
Reliable Measurement in Narrow Vessels

The LL-100 laser level measurement sensor is used for level control, plugged chute detection, and monitoring buildup. This non-contact device can be used in bulk solids, pellets, or granular materials of all material dielectrics in a variety of vessels. Laser can also be used in opaque liquids. It measures in a tight 1° beam, so there is no beam divergence, making it suitable for use in very narrow vessels or constrained spaces. Narrow beam laser measurement technology is resistant to reliability issues caused by surface angle, slope, texture, granularity, or material color.

Highly Accurate with a Rapid Update Rate

The laser level measurement sensor has a measuring range up to 160 feet and is highly accurate up to +/- 1 inch. It offers continuous level monitoring with a rapid update rate of eight times per second. The LL-100 can be aimed with great precision, making it suitable for vessels with interfering structure or with corrugation. It can also be applied in cramped, restrictive process equipment such as chutes or hoppers, or in confined equipment such as crushers. Laser is unaffected by heavy vapors and pressure making it very versatile across a wide variety of industries and materials.

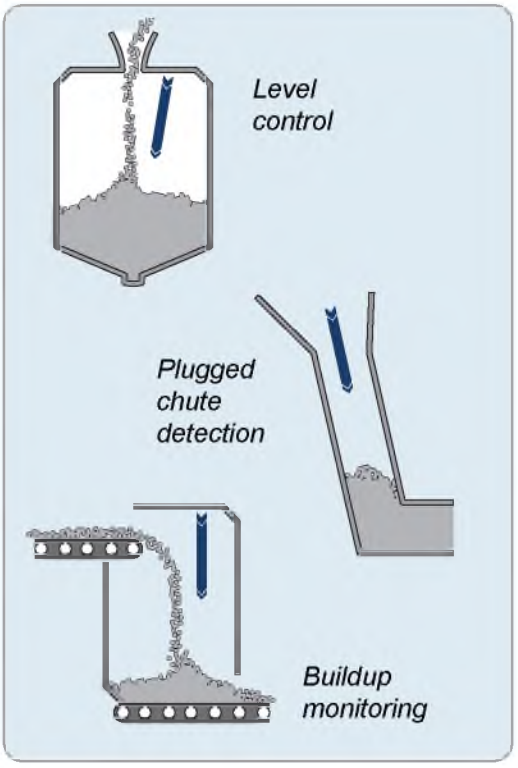


Reliable level or plugged chute detection:

- Adjustable mounting flange flexible up to 10 degrees
- Narrow beam can be directed to the output or bottom of the silo
- Compatible with BinCom and BinView
- Easily configured in the field using a USB port
- Configuration can be performed without filling or emptying the silo
- Integrated still-air barrier prevents dust particles from interfering with the optics
- Air purge option to keep lenses free of dust for reliable performance

Simple Setup & Operation

The LL-100 requires 24 VDC input power and produces a 4-20 mA output. A USB port is used to input configuration parameters and adjust settings. The USB port can also be used to power, configure, and align the sensor in the event power is not available in the field. The status of the device can be viewed on a terminal device using the USB port.



Flexible Mounting up to 10°

The LL-100 installs through a 2.5 inch process connection or a 4 inch flange connection on the roof of the silo, or is mounted inside the silo on a bracket above the material being measured. To point the laser beam at the desired measurement point, simply loosen the clamp ring on the adjustable flange and aim the body of the sensor to the desired angle. Then, tighten the clamp ring to hold the desired position.

The 4-20 mA outputs are used to set the full and empty parameters for the silo. The LL-100 laser sends pulses to the material surface and uses advanced algorithms to convert the timing of the pulses to a very accurate distance measurement. The sensor firmware automatically takes into account when the sensor is mounted at an angle, and adjusts the absolute distance accordingly.

Industrial Applications

- Minerals & mining
- Aggregates
- Ores
- Crushers
- Plastic
- Chemicals
- Fertilizer
- Pulp & paper
- Grains
- Biomass
- Food processing
- Power plants

Specifications

Range: 1 ft. to 160 ft. (.3m to 50m)
Resolution: 10mm
Accuracy: 1 standard deviation = 1 inch (2,5 cm)
Update Rate: 8 readings per second
Output: 4-20 mA NAMUR
Filling Rate: 0,01 to 100m/min
Power Supply: 24 VDC nominal (12-28 VDC)
Communication: USB 115200 baud 8-N-1
Operating Temperature: -4°F to 160°F (-20°C to 50°C)
Electrical Connection: M16 x 1,5
Enclosure Rating: IP66
Air Purge: 1/8" BSP option
Housing Material: Anodized aluminum
Lens Material: Impact-resistant acrylic
Beam Divergence to half power points: <1°
Laser Safety Classification: Class 1M
Caution: Do not view laser directly with optical instruments.

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CVR-625

Compact Vibrating Rod
Instruction Manual

925-0319 Rev 0

0814

BINMASTER®

TABLE OF CONTENTS

SAFETY

CVR-625 Compact Vibrating Rod

IMPORTANT

For safety and proper function of the instrument, please carefully read this instruction manual before installation!

Application

The CVR-625 is a vibration type level control instrument that detects the minimum and maximum level in bins, silos and hoppers, filled with granular materials. Typical product applications are plastic granules, feed pellets, raw grains, etc.

IMPORTANT

The instrument cannot be used for detecting materials which are sticky and tend to build a deposit on the probe! The CVR-625 is not recommended for detecting powdered materials.

General Notes

- Installation and maintenance must be performed by qualified technical personnel only.
- The CVR-625 must be used only in the manner outlined in this instruction manual.
- The CVR-625 vibrating level switches are sensitive devices which need to be handled with care.
- Never expose this instrument to mechanical loads and temperatures higher than indicated in the technical data. It may only be serviced by qualified personnel.

Function

The signal from the electronic circuit of the CVR-625 excites the rod of the instrument to vibrate on its resonance frequency of approximately 460 Hz. When material covers the rod of the probe, the vibration stops. This is sensed by the electronic circuitry which forces an output relay to switch. When the blade is uncovered, the vibration will restart and the relay will switch back.

TECHNICAL

Enclosure:	Die cast aluminium, powder coated Protection IP 66 1 cable gland M16 Suitable for cable diameters 0.177 to 0.394 inches
Probe:	Stainless steel 1.4301 / AISI 304 Resonant frequency approximately 460 Hz
Mounting:	1.25" NPT
Power Supply:	Wide range power supply 20...250V AC/DC
Power consumption:	3 VA
Relay:	1 SPDT Maximum switching voltage 250V-AC Maximum switching current 5A Maximum switching power 1250 VA Cos φ = 1; 150 Watt for DC
Time Delay:	1 second from stop of vibration 2 to 5 seconds for start of vibration
Indication:	Relay: red LED on PCB Power: yellow LED on PCB

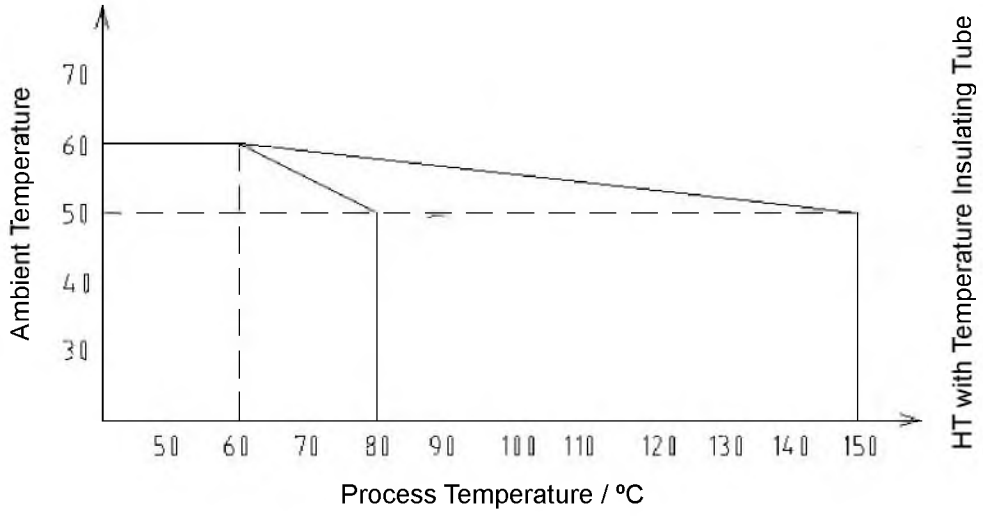
Minimum density of material to be monitored: 3.12 lb. / cu. ft. (50 g / liter)

Maximum vertical and horizontal load upon the end of the blade: 80 N

Maximum pressure inside bin: 10 bar

Temperatures (see also following sketch):

- Ambient temperature for electronics: -4°F to +140°F (-20°C to +60°C)
- Process temperature for standard probe: -4°F to +176°F (-20°C to +80°C)
- Process temperature for probe HT: -4°F to +302°F (-20°C to +150°C)
  (special model for high temperatures)



INTRODUCTION

1.0 CE-CONFORMITY

The vibration type level switch CVR-625 meets the requirements of the following regulations:

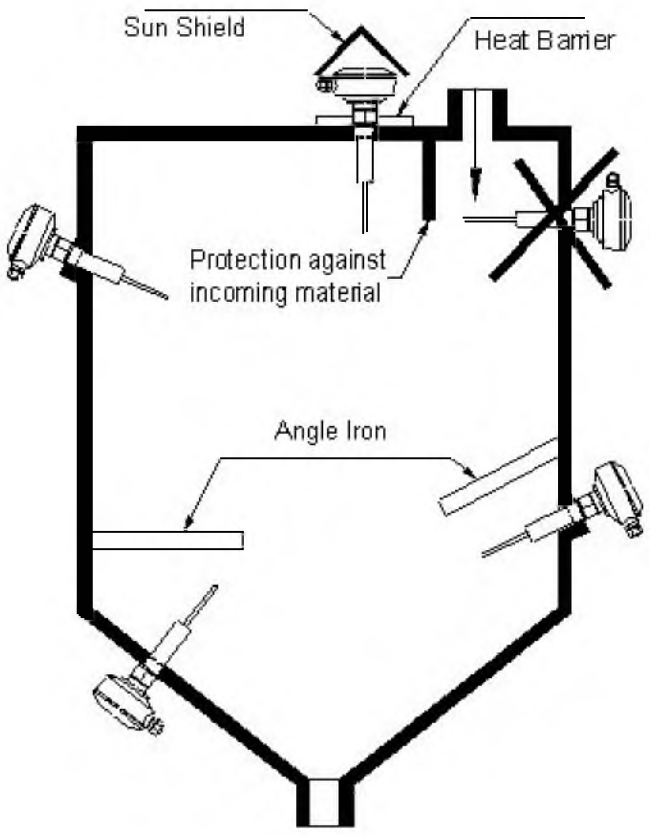
- EG-EMC-directive 89 / 336 / EWG
- EG-Low Voltage Directive 73 / 23 / EWG

Applied standards: EN 61326-1, EN 61326 / A1, EN 61010 T1

2.0 MOUNTING

The following has to be considered when mounting the CVR-625:

- The switching point of the CVR-625 depends on the density of the material. For heavy materials, only a few millimeters of the vibrating rod have to be covered for damping the vibration. For light materials, the material must cover the vibrating rod completely in order to damp its vibration.
- The CVR-625 must not be mounted in or near the path of incoming material. The falling material could damage the probe.
- In order to keep the ambient temperature of the PCB within the allowed range of -4°F to +140°F the housing should be protected from direct sunlight by installing a sun shield.
- A heat barrier has to be installed between the enclosure and the bin wall when the temperature of the material inside the bin exceeds 140°F (60°C). Alternatively, it also is possible to use a temperature insulating tube which must be mounted between mounting socket and enclosure, (see chapter *Special Models*).



3.0 SIDE MOUNTING OR VERTICAL MOUNTING

- The CVR-625 can be mounted either from the side or vertical, from the top or the bottom.
- For side mounting, it is recommended to screw the CVR-625 into the bin wall with the vibrating rod pointing slightly downwards (approximately 20°), so that material can more easily flow and does not rest on the vibrating rod.
- The CVR-625 must not be mounted in or near the path of incoming material. If this cannot be avoided a protective shield, for example an angle steel with side length of approximately 2 inches, must be installed approximately 6 inches over the probe. A protective shield is also necessary for low level detection in order to protect the probe against falling material.
- The CVR-625 gets installed by screwing the mounting socket of the instrument into the bin wall by means of a 46 mm open end wrench.
- A suitable sealing, (like Teflon tape), must be applied onto the thread.

IMPORTANT: Do not screw in the CVR-625 by turning the housing body!

Orientation of the cable glands:

The cable glands must always point downwards to prevent moisture seeping inside the housing. If the housing is not in the correct position after the probe has been firmly screwed into the bin wall, proceed as follows:

- Remove the cover of the housing, using a 4mm hexagon socket screw key, (Allen key)
- Use a 10mm wrench to loosen the mounting nut in the center of the enclosure
- Turn the housing into the correct position so that the cable glands are pointing downwards
- Tighten the mounting nut, torque 3 to 4 Nm
- Close the cover of the housing (torque 3 Nm)

Cable glands which are not used must get sealed!

Wiring

Safety Guidelines:

- Wiring of these instruments must only be performed by qualified technical personnel.
- Before opening the cover and beginning wiring, make sure that power supply on all wires has been switched off.
- According to DIN EN 61010-1, a main switch for this instrument has to be installed nearby the instrument with which power supply for this instrument and its relay output can be switched off. This switch must be marked as main switch of the instrument.
- For power supplies Ø 50V, protective earth has to be connected to the terminal on the enclosure.
- If power supply and relay signal do not have the same source, the connecting wires of the power supply have to be separated from the connecting wires of the relay by means of wire fasteners. This prevents the connecting wires of the power supply getting in touch with the relay terminals and vice versa, which might be possible in case of an error, such as a break of a wire.

The cables for the power supply and relay must be connected to the terminals according to the following diagrams.
This is also printed on the PCB.

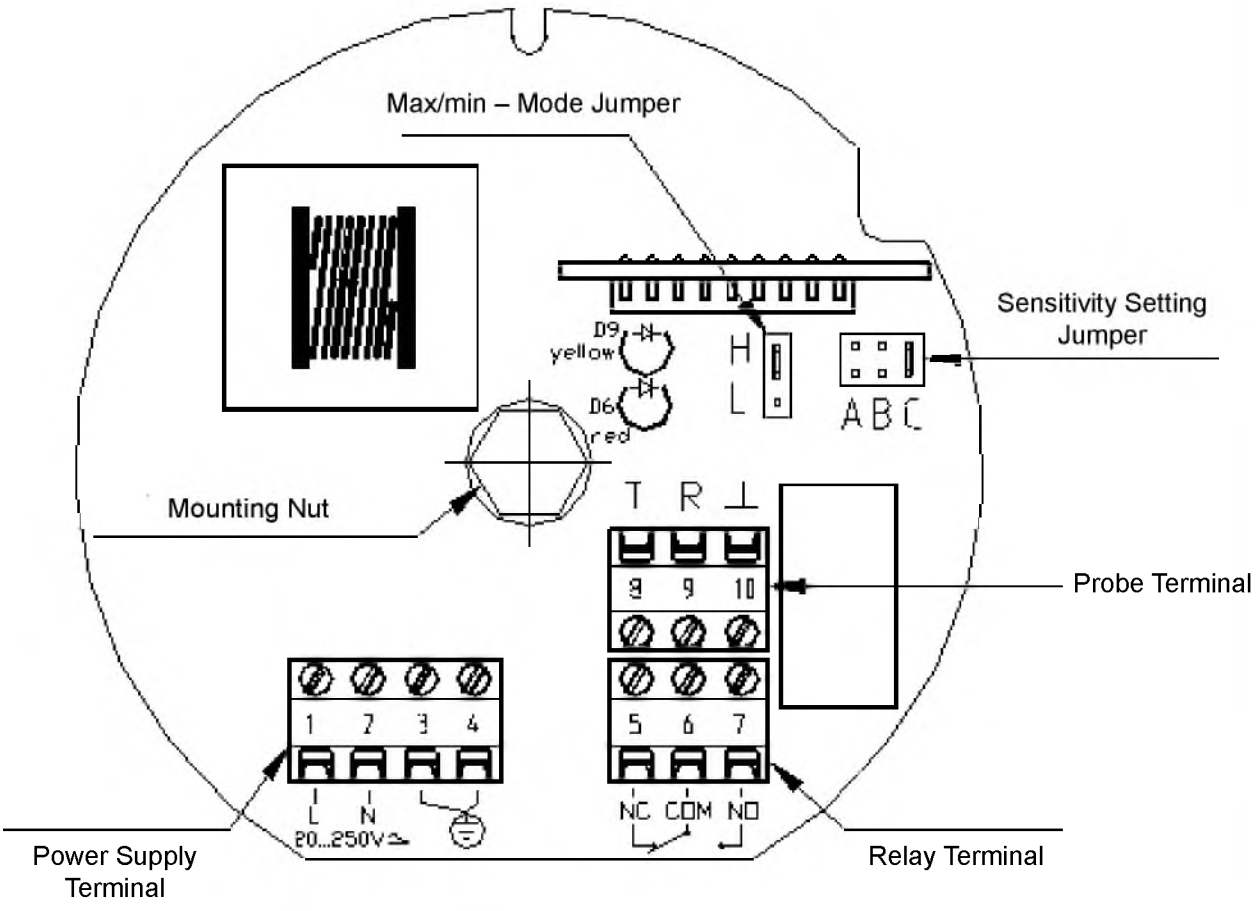
Terminal for power supply:
1 = L
2 = N } 20...250V AC/DC
3 = protective earth
4 = protective earth

Terminal for output relay:
5 = NC
6 = COM
7 = NO

The maximum wire size for power supply and relay is 14 AWG.

The probe is connected to the PCB by the three leads of the probe:

Terminal probe:			
	8 =	T	(red lead)
	9 =	R	(yellow lead)
	10 =	⊥	(black lead)

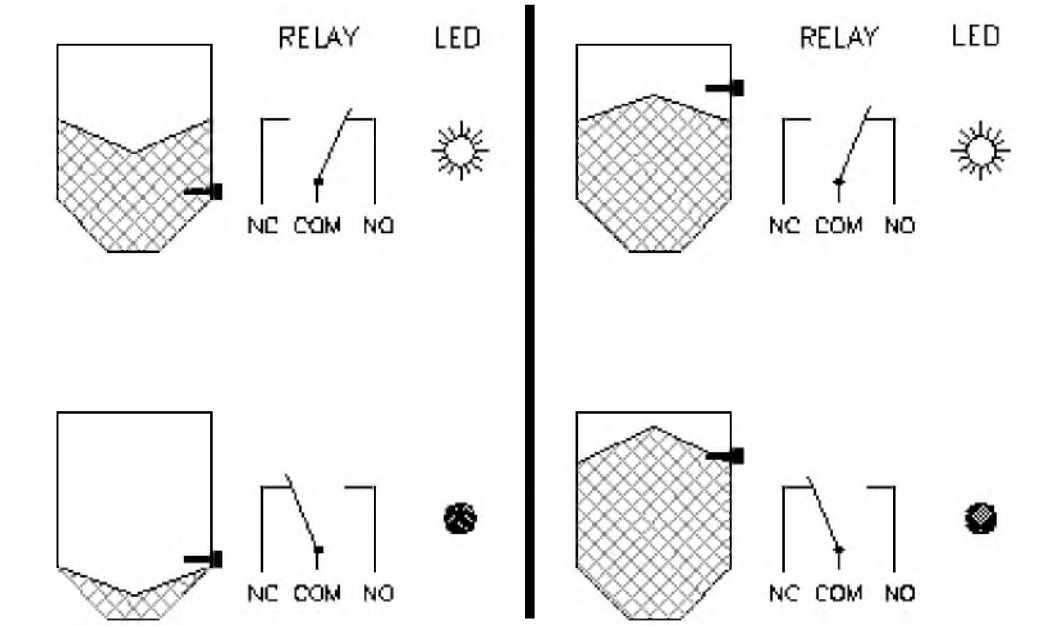


4.0 ADJUSTMENT

Fail-Safe High (H) / Fail-Safe Low (L):
Switching Logic: See following sketch.

Fail-Safe High: Jumper in position H: for high level alarm:
The relay is de-energized (position NC, red LED off), when the blade is covered by material or power has failed.

Fail-Safe Low: Jumper in position L: low level alarm:
The relay is de-energized (position NC, red LED off),
when the blade is not covered by material, or power has failed.



Sensitivity:

Selectable by jumper:

Pos. A: Use this setting only for light material with densities down to 3 lb./cu.ft. or 50g/l. The sensitivity is high at this setting.

Pos. B: Standard setting, sufficient for most materials.

Pos. C: For heavy materials with high densities, which may form a deposit on the vibrating rod. As the sensitivity of the instrument is low at position C, light materials can not be detected at this setting!

5.0 SPECIAL MODELS

- **Special model for high temperatures:**

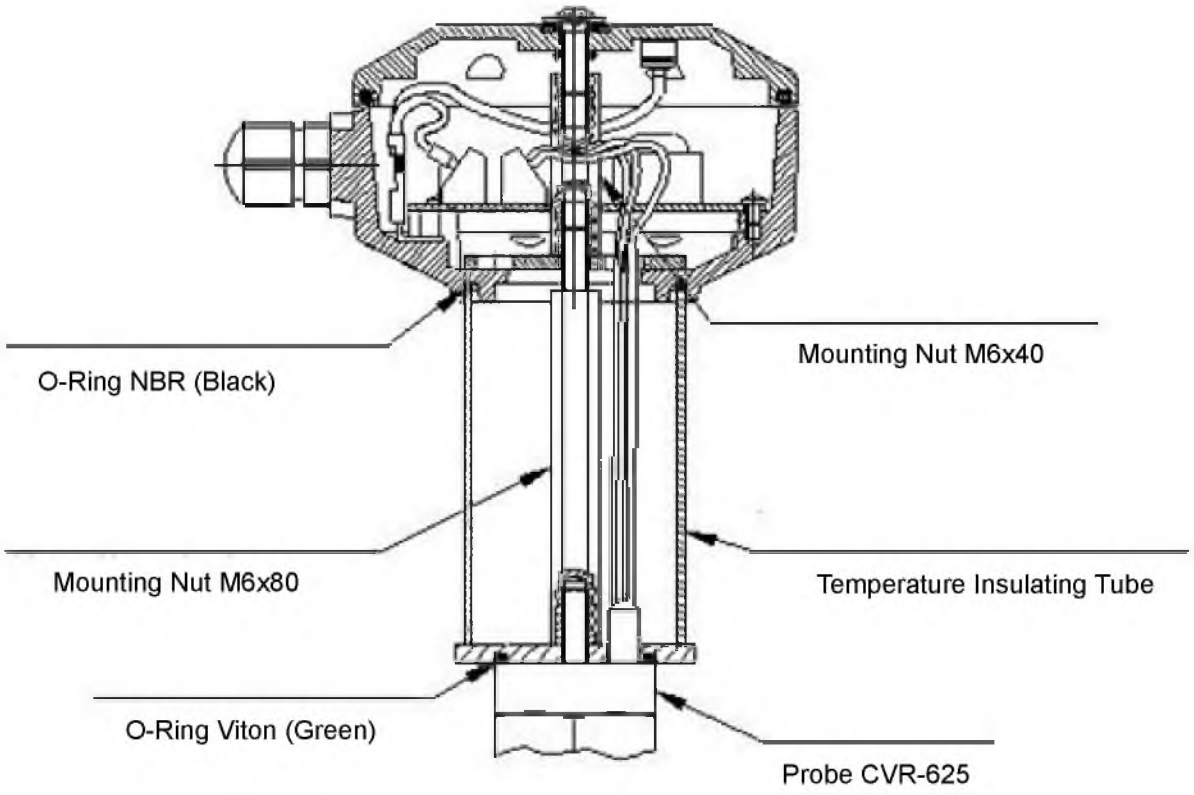
Can be used for process temperatures up to 302°F (150°C).

Important: the instruments are similar to standard instruments, except they are marked with a *"Special Model HTL"* label and the serial numbers of probes and electronics do have the suffix *"-HTL".*
Special model probes must only be used with special model electronics!

In order to ensure that the ambient temperature of the electronics (140°F or 60°C), will not be exceeded due to thermal conduction via the probe, a temperature insulating tube has to be mounted between probe and the enclosure or the electronics have to be installed at a remote location (see following chapters).

- **Temperature Insulating Tube (see sketch below):**

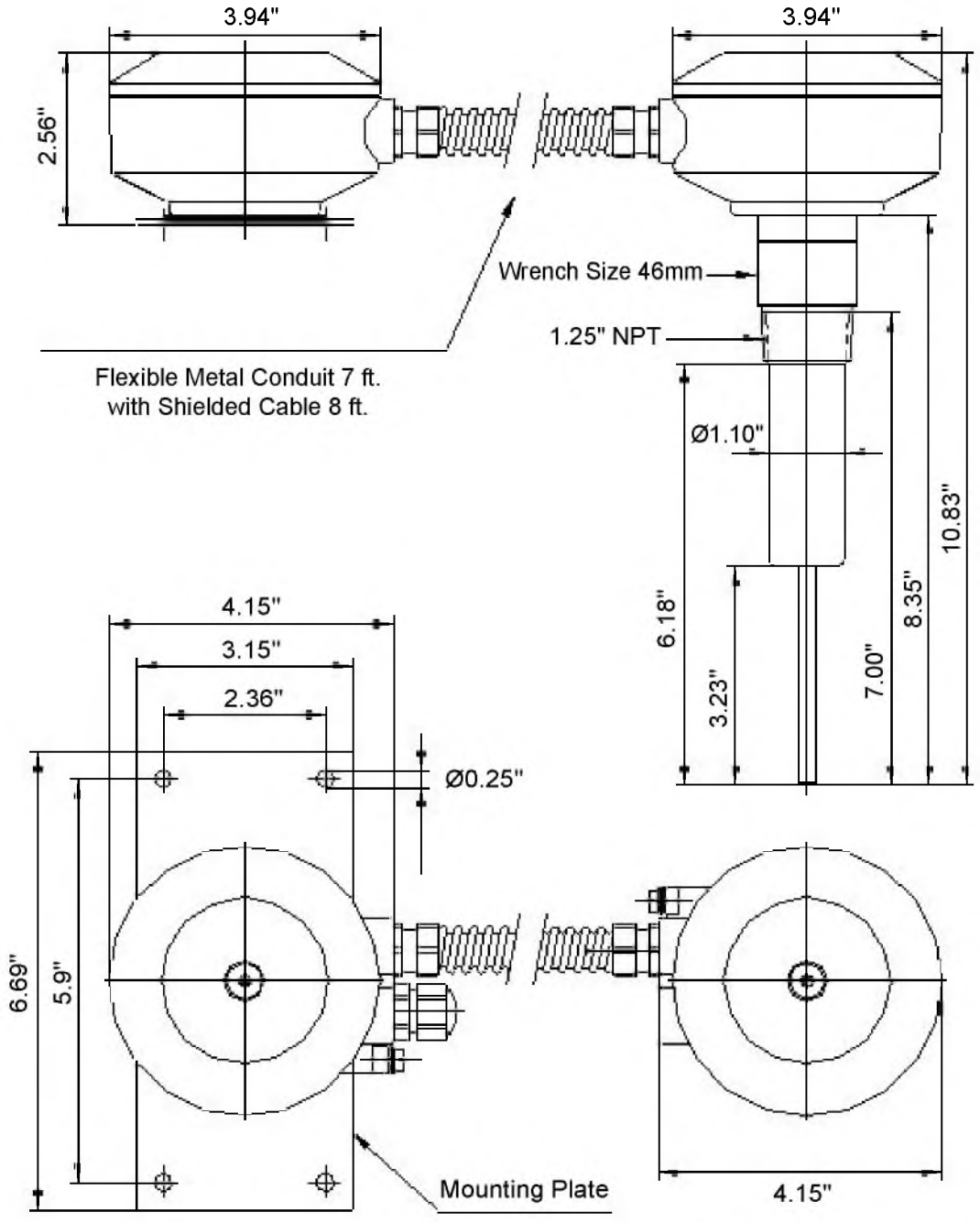
The temperature insulating tube consists of a stainless steel tube Ø50mm which is welded onto a stainless steel plate. The tube gets fixed onto the mounting socket of the probe by means of an 80mm long mounting nut M6. The enclosure gets fixed onto the tube by means of a washer Ø50x3 and the mounting nut M6x40. The green O-Ring (Viton), must be located between the mounting socket and tube and the black standard O-Ring must be located between tube and enclosure. Use a torque of 3 to 4 Nm for the mounting nuts.



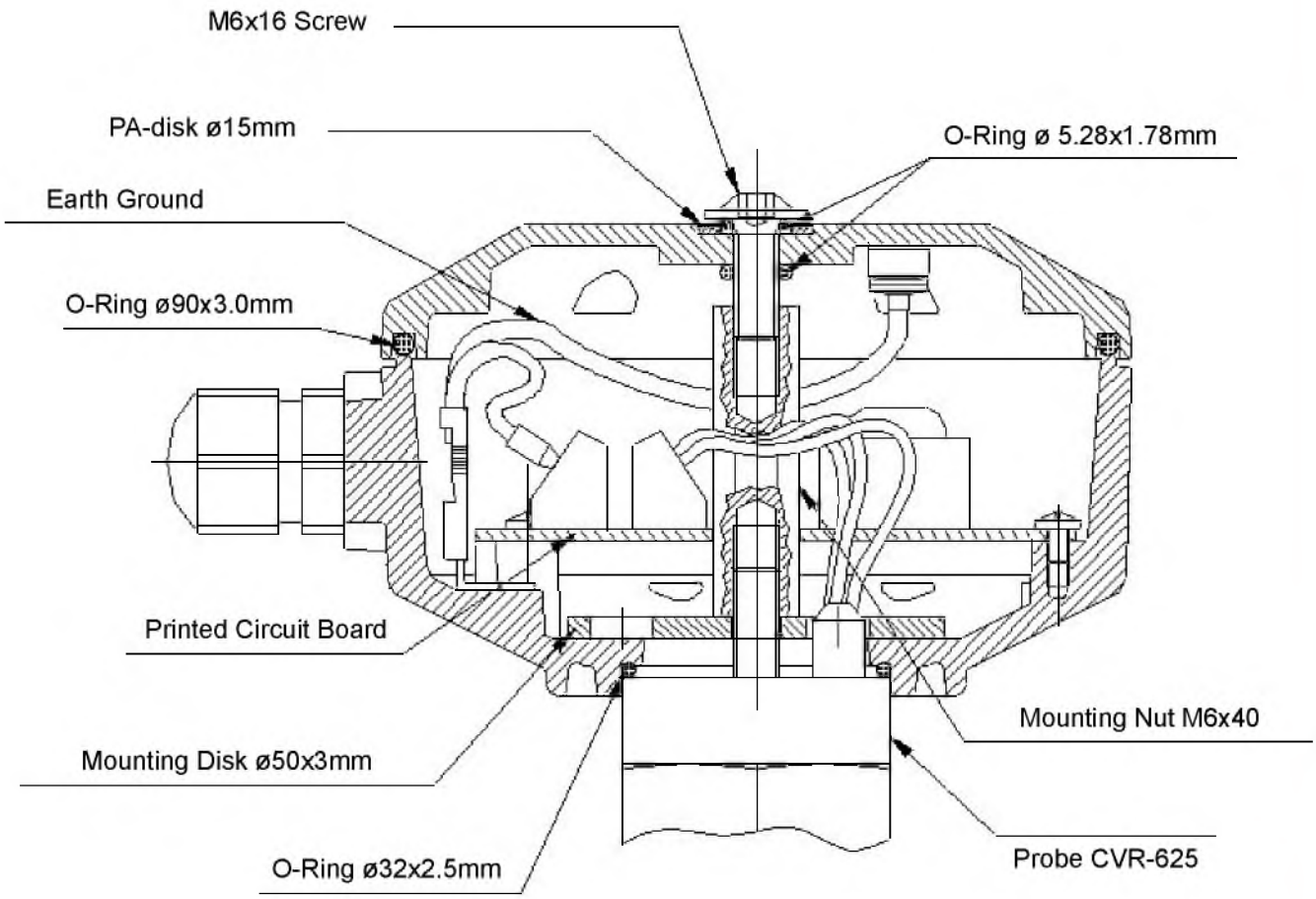
- **Remote Electronics Installation**

If the temperature outside the bin near the bin wall exceeds the maximum ambient temperature of the PCB (140°F or 60°C), it is necessary to install the PCB in a remote enclosure apart from the bin where the temperature is within the allowed range. Remote electronics installation is also necessary in the case of heavy vibration in the bin. In this case, the remote enclosure has to be installed at a place away from the vibration.

The PCB and probe get connected by a shielded cable via the terminal PCB, which is located inside the enclosure fixed on top of the mounting socket of the probe. A metal hose, which is screwed between the remote enclosure and the enclosure that contains the terminal PCB, is protecting the cable. The remote enclosure can be installed by means of the mounting plate. The cable and metal hose can withstand temperatures up to 176°F (80°C). Protection of the remote electronics installation is rated at IP65.



Assembling of probe, enclosure and electronics must be done according the following sketch.



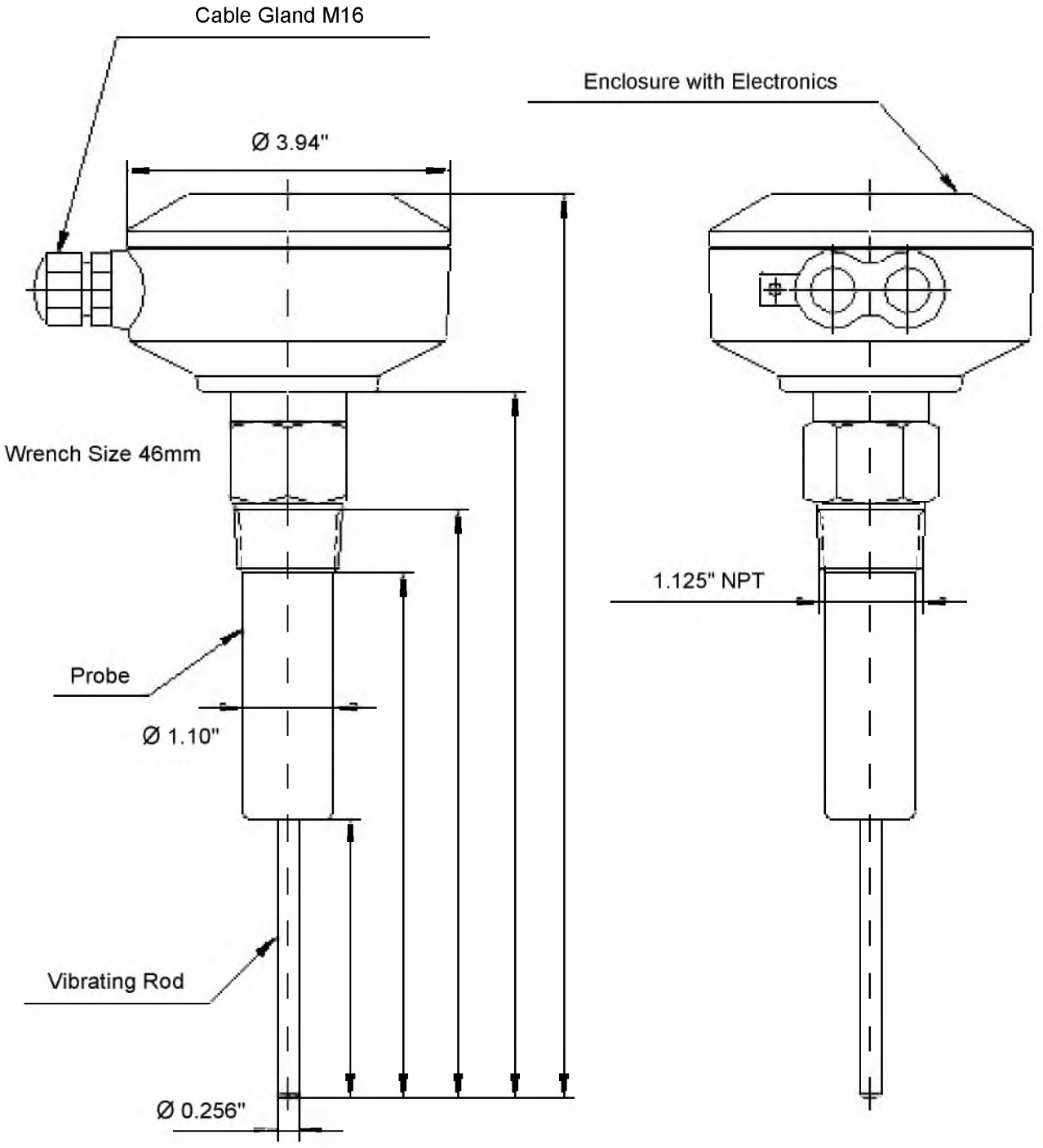
Note the following:

- Assembling must be done by qualified personnel only
- All O-Ring seals must sit in its appropriate position according to the sketch
- Apply torque 3 to 4 Nm for the mounting nut M6x40
- Apply torque 3 m for the screw M6x16
- Apply torque 3 Nm for the cable gland
- If special versions are being used, do not mix different version probes with electronics

6.0 MAINTENANCE

The CVR-625 vibrating type level switches require minimal maintenance. For applications with materials that are sticky, we recommend cleaning the vibrating blade of the instrument periodically. If the instrument is operating in a corrosive atmosphere, the probe and enclosure must be inspected periodically for corrosion.

7.0 DIMENSIONS



LIMITED WARRANTY

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.

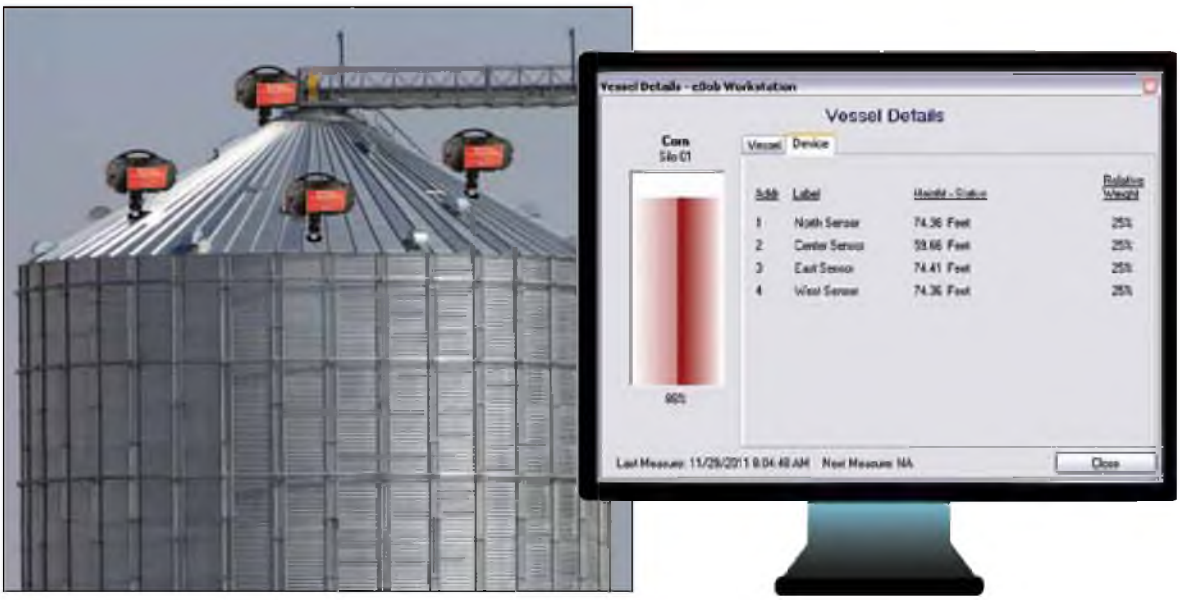
2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.

3.) This warranty shall not apply to any product that has, in manufacturer's judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied.

SmartBob MultiBob System

Multiple Measurement Points in a Single Vessel To Improve Material Inventory Management



- Two to 32 SmartBob sensors on a single vessel
- Software averages level for selected sensors
- View levels for one sensor or all sensors
- Can indicate cone up or down conditions
- Detects high and low spots
- Strapping tables for custom vessel configuration
- Takes measurements at user-defined intervals
- Initiate measurements on demand
- Automated alerts for various alarm conditions
- No climbing, no tape measures!

BINMASTER®

Multiple Sensors, One Average Level

The MultiBob system allows two or more SmartBob sensors to be mounted in a single bin. The measurement data from each sensor is averaged in the advanced eBob software based upon user-defined parameters to provide a single level measurement for the bin. By taking measurements in multiple locations, there is more detailed data available to users about the material in their bin. Depending on how many SmartBob sensors are mounted in the bin, the user can use the data to determine conditions such as cone up or cone down, whether there might be a high or low spot in the bin, and which filling or emptying points they want to target in multiple-fill, multiple-discharge point bins.

More Measurement Data, Better Decision Making

The MultiBob system has applications across many industries and material types. Unless it is a liquid, the material in a bin is likely to be uneven. Some industries, such as cement, power and food processing tend to deal with challenging materials like limestone, fly ash or flour that can be challenging to measure. Large diameter bins such as 105' wide, or million-bushel bins often found in the grain and ethanol industries can have high and low spots due to multiple filling and emptying sites. Even smaller diameter bins, such as those containing pellets, granules, or other free flowing ingredients might have material higher or lower in the center or on one side of the bin.

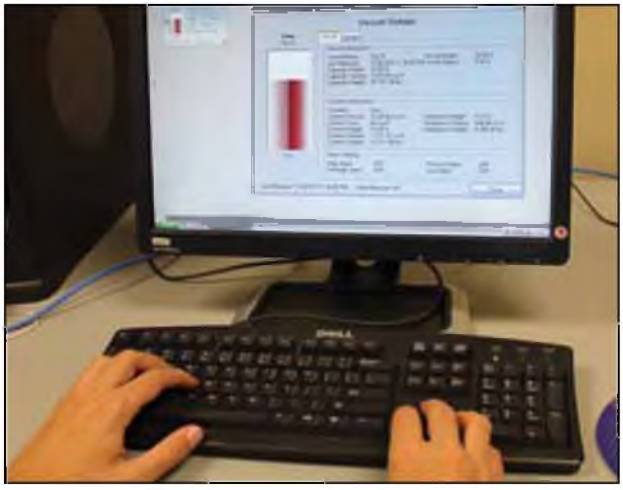
MultiBob System Applications

- **Any bin where the user wants more measuring points**
- **Bins containing material prone to accumulate in piles**
- **Large diameter bins where material tends to be uneven**
- **Grain bins such as 105' or 132' diameter or million bushel bins**
- **Bins with multiple filling and emptying points**
- **Operations where more data is desired to determine inventory levels**
- **Bins containing difficult to measure material**

Simple to Set Up, Easy to Configure

Based upon their data needs, users can determine how many SmartBob sensors to install in the bin. The MultiBob system can be set up for two SmartBob2 sensors, or up to 32 sensors in a single bin, warehouse or storage facility. The software allows measurements to be scheduled at predetermined time intervals. Users can customize the timing of measurements to suit their operations. Plus, if a real-time measurement is needed, the eBob software can be used to initiate an on-demand measurement and immediately report the data.

Upon opening the eBob software, the user can view all of the bins in the network and choose how they want to view the data. The software provides the percentage full and average level or headroom and what material is contained in the bin. By clicking on a single bin, the user can view the detail screen for a particular bin that includes all of the SmartBob sensors associated with that bin. The MultiBob system reports the individual measurements for each SmartBob sensor used to create the average level (or headroom) and percentage full.



A percent value can be assigned to each sensor to prioritize the influence each sensor has on the average level. For example, the input from each sensor can be divided evenly so each sensor has an equal influence on the average level OR if the end user wants one or two sensors to have a greater influence on the average, a higher percentage of influence can be assigned. The total percentage for all sensors must always add up to 100 percent.

MultiBob is Smart, Simple and Safe

- **SmartBob sensors are highly reliable, accurate and affordable**
- **No need to climb tanks to take measurements, saving time and increasing safety**
- **Takes frequent measurements from multiple locations within the bin**
- **Users can initiate an on-demand measurement from all sensors or a single sensor**
- **Multiple sensors detect high and low spots in the bin**
- **Placing a sensor in the center of the bin can indicate cone up or cone down conditions**

Two-Sensor Setup Can Indicate Cone Up or Down Conditions

Installing two SmartBob sensors in a center fill, center discharge bin is a simple solution for operations that want to know if the material in the bin is in a cone up or cone down condition. It is recommended that one sensor is mounted one-sixth of the distance from the outer perimeter of the bin. This location is proven to deliver a high level of accuracy by accounting for the angle of repose in a center fill, center discharge bin containing free flowing material. The second SmartBob sensor should be mounted near the center of the bin, but away from the fill stream.

Sensor 1 is mounted one-sixth from the outer perimeter. Sensor 2 is mounted near the center away from the fill stream.

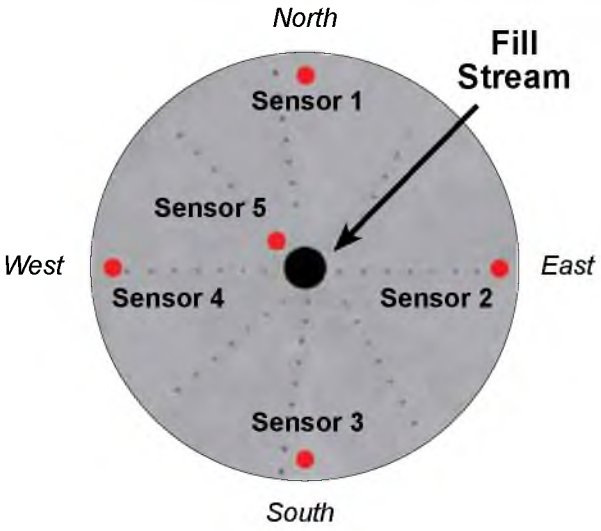
When measurements are taken, a higher level (or smaller headroom distance) from the SmartBob sensor near the center of the bin can indicate a cone up condition. Conversely, a lower level (or greater headroom distance) from the SmartBob center near the center of the bin can indicate the cone is down. When a two-sensor configuration is set up in this manner, it is recommended that the SmartBob sensor mounted one-sixth of the distance from the outer perimeter of the bin is assigned 100 percent of the value, as the location of this sensor will provide the most accurate volume estimate. Measurements can be scheduled any time while the bin is emptying or after a filling cycle is complete.

The higher measurement at the center indicates a cone up condition.

Operations with large active bins—such as fertilizer—will benefit from multiple sensors.

The two sensor configuration is ideal for any facility that would find knowing whether the bin is cone up or cone down is beneficial to operations. This configuration can be applied to all types of industries, materials and diameter bins. The additional data from the SmartBob sensor mounted near the center of the bin can be used to help notify personnel that a bin is nearly empty or full.

Multiple-Sensor Setup Detects High and Low Spots, plus Cone Up or Down



By installing multiple SmartBob sensors in the bin, it is also possible to detect if material is accumulating in one or more measurement points in the bin. In this example, there are four sensors mounted around the outer perimeter of the bin, each one-sixth the distance from the outer perimeter – with one sensor each on the north, south, east and west in equal distances from one another. The fifth SmartBob sensor is mounted near the center of the bin, but away from the fill stream.

Sensors 1 to 4 are mounted one-sixth for the outer perimeter. Sensor 5 is mounted near the center, away from the fill stream.

When measurements are taken, the eBob software allows the user to view the percentage full and average distance, or headroom if preferred based on user-defined values for each sensor. Additionally, the level data for each SmartBob sensor can be viewed to allow the user to check for high spots in the bin. For example, a higher level on the west wall of the bin may indicate that material is accumulating in that area. As with the two-sensor configuration, a higher measurement (or smaller headroom distance) from the center SmartBob sensor can indicate a cone up condition, while a lower measurement (or a greater headroom distance) from the center sensor can indicate the cone is down. For the most reliable volume estimate, it is recommended that the four sensors at the outer perimeter each be given a value of 25 percent and the center sensor is valued at zero, using the fifth measurement for cone up or down indication.

These measurements indicate cone down and a higher level on the South sensor.

Safety first at this high efficiency cement plant.

The multi-sensor configuration is also helpful in bins where there are multiple filling and emptying points. By viewing the level data from each sensor, decisions can be made regarding the most optimal location to fill the bin to optimize storage capacity or which emptying point is best to pull material. This configuration is very well suited to large diameter bins where material is likely to accumulate due to filling and emptying sites. Multiple measurements will indicate where the high and low spots exist. Any operation that wants better data about the material in their bin will benefit from the multi-sensor configuration.

MultiBob is a Better Bin Management Tool

The BinMaster MultiBob System is a tool to better manage the contents of a bin, tank or silo by providing data from more than one SmartBob sensor. The display screen for each bin supplies a wealth of information that can be used for better decision making and to streamline operations by eliminating the need to climb and manage bins one at a time. Simply log in to eBob to view the levels of all bins in the network at a glance. The bin network can include bins with just one sensor or bins with multiple sensors.

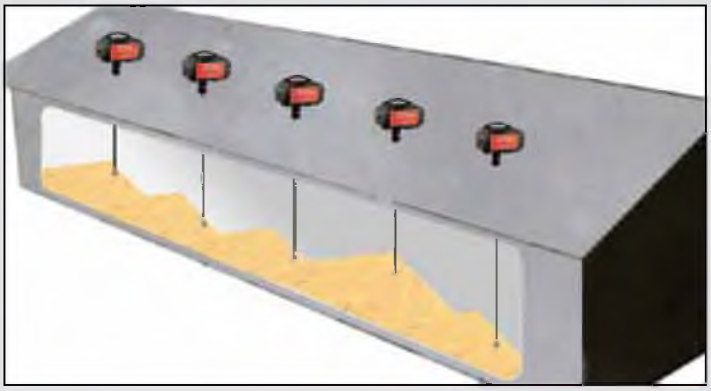
MultiBob Application Examples

Wide Diameter Bins

In the grain industry, the MultiBob system is ideal for large diameter bins such as 105' or 132' diameter bins. The eBob software can indicate cone up or down and if material is accumulating on one or more sides of the bin.

Million Bushel Bins

Grain bins with capacity of a million bushels or more are ideal candidates for a MultiBob system. SmartBob sensors can be installed in key locations where having measurement data is most critical, such as for detecting high and low spots to optimize filling and emptying points in the bin.



Flat Storage Warehouses

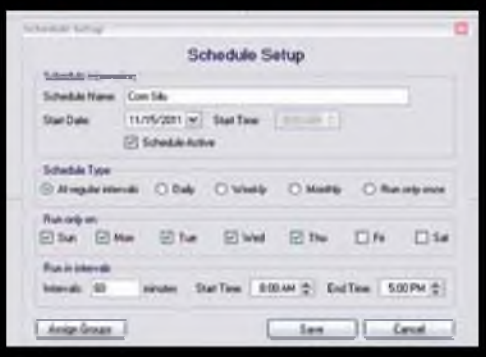
The MultiBob system can also be used in long warehouses to measure the height of piles in up to 32 different locations and provide an average pile height. MultiBob systems can be installed in flat grain storage warehouses along trusses or conveyors.

Sensors are mounted from roof structure, conveyors or trusses at desired locations.

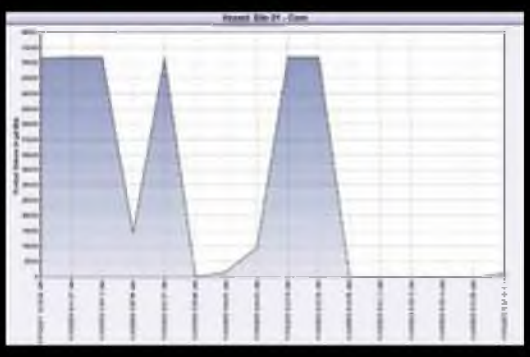
Multiple Bins on Site

Locations with multiple bins of all sizes, such as cement, chemical, and plastics plants or food processing facilities and feed mills will find a SmartBob system of great value. By installing a MultiBob system in the large and variable bins and a single SmartBob sensor on smaller or less challenging bins, a facility can view the levels of all of its bins from the eBob software from the comfort of an office.

Optimize Vessel Management



Each vessel can be set up to take scheduled measurements at pre-determined time intervals.



Vessel history and tabular measurement data are stored in a SQL database.

Customize Data with Strapping Tables

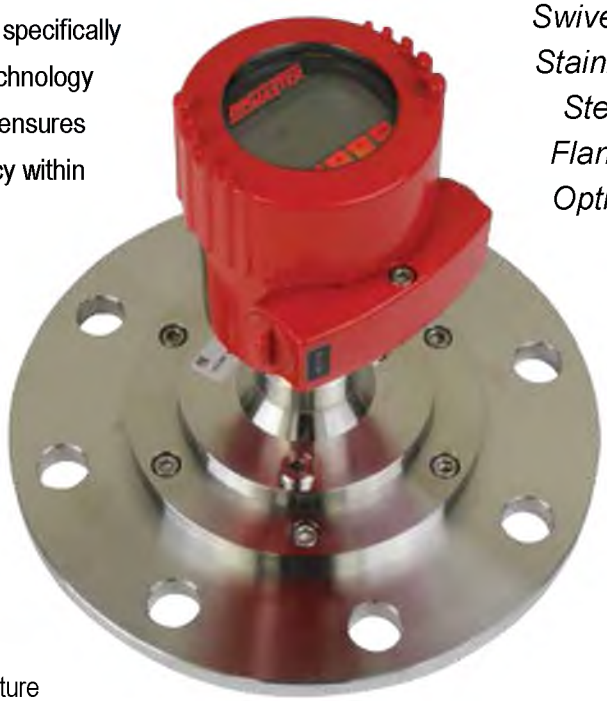
The advanced eBob software allows the user to add a strapping table to the bin parameters to further personalize the data for a particular bin. Strapping tables are helpful when the material in the bin tends to compact and the bulk density of the material is higher at the bottom of the bin than the top. In a non-linear vessel, the addition of a strapping table will improve the estimated volume of material in the tank.

Entering a custom strapping table is helpful in a non-linear vessel or in material that tends to compact.

The strapping table information is entered by the user into the eBob software. The user simply inserts the number of pounds, bushels, tons or other units of measurement based upon a specific distance or range of distances. There is no limit to the number of values that can be entered into the strapping table, so the data can be as detailed as needed if the material density is highly variable from the bottom to the top, or the bin is very tall.

Non-Contact Radar with Superior Performance in Solids

The BinMaster NCR-80 is a non-contact radar level sensor designed specifically for superior performance in powders and bulk solids. Its advanced technology uses an 80 GHz frequency focused in a narrow 4° beam angle. This ensures reliable performance at measuring ranges up to 393 feet and accuracy within 0.2 inches. The NCR-80 is ideal for continuous level measurement in tall and narrow vessels where there is excessive noise or dust.



Swiveling Stainless Steel Flange Option

Reliable level measurement. 80 GHz of power.

There are two configurations of the NCR-80 and three different housing options including plastic, stainless steel, or aluminum. One configuration features a 10° swiveling, stainless steel flange for precise targeting at the material in the silo. It is suitable for high temperature applications up to 392°F. The other configuration mounts using an 8° swiveling flange or a mounting strap that allows for adjustable targeting and has a lightweight plastic antenna. The plastic antenna is for use in process temperatures up to 176°F.

NCR-80 for Bulk Solids

- **Powerful 80 GHz non-contact radar**
- **Measuring distance up to 393 feet**
- **4° beam angle for precise targeting**
- **Reliable accuracy within 0.2 inches**
- **High temperatures up to 392°F**
- **Hazardous location approvals**
- **BinDisc option simplifies setup and configuration**

Lightweight Plastic Antenna Option

NCR-80

Non-Contact Radar

BINMASTER®

Narrow 4° Beam Angle

The narrow 4° beam angle allows for precise aiming to avoid the flow stream, internal structure, or sidewall buildup. Narrow focusing also simplifies setup, as the signal will reflect only from the measured material being targeted. The NCR-80 is resistant to interference, while its advanced filters ensure rapid signal processing and a fast update rate. Its advanced firmware constantly tracks echoes and automatically eliminates false echoes for reliable performance.

Sealed System is Maintenance Free

The antenna lens is encased in a sealed antenna system. This makes it resistant to dust buildup and virtually maintenance free. The NCR-80 has a flush face that does not protrude into the vessel which prevents potential damage to the sensor. The plastic lens is made of durable, PEEK plastic for ruggedness and long lasting performance. It is chemical resistant for tough applications and has FDA approval, making it suitable for food and pharmaceutical use.

The NCR-80 comes standard with an air purge connection, which is only necessary for extreme conditions with high dust that will cause dust buildup on the lens. It is designed for low air consumption to save on compressed air costs, ensuring fast and efficient cleaning for high dust applications.

80 GHz focuses a narrow 4° beam that measures only material; a 10° beam from 26 GHz may detect internal structure, corrugation, or buildup.

Fast and Simple Setup with BinDisc

An optional BinDisc interface enables push-button sensor setup and configuration. The BinDisc is integrated into the sensor housing and is installed and visible under the housing cover for easy viewing. BinDisc simplifies setup and provides continuous, at-a-glance, operational status of the sensor. This handy interface aids in on-site system diagnosis. Data can also be sent to a PLC in a control system.

NCR-80 Excels in Solids

Grain Storage

- 4° beam angle is ideal for tall, narrow bins or bins with internal structure
- Segmented cement grain bins with multiple compartments
- Bins where the sensor must be mounted near the bin wall
- Targeted locations on grain piles or flat storage warehouses
- On large conveyors for distance measurement to detect overloading

Cement Silos

- Clinker silos with excessive noise and high temperatures
- Tall or narrow finished cement silos with excessive dust
- Adaptable to powders or bulk solids of raw and finished materials
- Over moving belts and conveyors to prevent overloading
- Inside rock crushers to monitor filling and emptying

Plastic Pellets, Powders, or Flakes

- For narrow silos where precise level is desired
- In low dielectric materials or materials with limited reflectivity

Sand and Aggregates

- For tall narrow silos with excessive dust or noise
- Mounted over piles or pits for level detection

Wood Chips or Pellets

- Detecting level of materials with varying dielectrics and moisture levels
- Performs in high steam environments

Power Plants

- Monitoring level in coal feeders to ensure continuous supply
- Mounted over piles or bunkers

NCR-80 Specifications

	Plastic Antenna	Stainless Steel Flange
Frequency	79 GHz	79 GHz
Antenna Type	3.15” (80 mm) plastic horn antenna	metal jacketed lens antenna
Measuring Range	393 feet (120 m)	393 feet (120 m)
Accuracy	± 0.2 in. (5mm)	± 0.2 in. (5mm)
Power Requirements	Regular Voltage Version: 90 to 253 V AC, 50/60 Hz Low Voltage Version: 9.6 to 48 V DC, 20 to 42 V AC, 50/60 Hz	Regular Voltage Version: 90 to 253 V AC, 50/60 Hz Low Voltage Version: 9.6 to 48 V DC, 20 to 42 V AC, 50/60 Hz
Process Temperature	-40°F to 176°F (-40° to 80°C)	-40°F to 392°F (-40° to 200°C)
Process Pressure	-14.5 to +29 PSI, -1 to +2 bar (-100 to +200 kPa)	-14.5 to +43 PSI, -1 to +3 bar (-100 to +300 kPa)
Mounting	3”, 4”, or 8” swiveling flange with 8° adjustable aiming or mounting strap	4”, 6”, or 8” swiveling flange with 10° adjustable aiming
Housing Material	Plastic	Aluminum
Enclosure Rating	IP66/IP68 (0.2 bar), IP66/IP67, IP66/IP68 (1 bar)	IP66/IP68 (0.2 bar), IP66/IP67, IP66/IP68 (1 bar)
Approvals	CSA / FM Class I, II, III, Div 1, Groups A, B, C, D, E, F, G Other Approvals Available	CSA / FM Class I, II, III, Div 1, Groups A, B, C, D, E, F, G Other Approvals Available
Output	Two-wire 4 - 20 mA/HART®, Four-wire 4 - 20 mA, Modbus RTU	Two-wire 4 - 20 mA/HART®, Four-wire 4 - 20 mA, Modbus RTU

BINMASTER®

SmartBob AO with 4-20 mA Output

The SmartBob AO is a weight and cable-based, stand-alone continuous level sensor featuring direct analog output. A simple push-button user interface built into the SmartBob AO circuitry is used to configure the bin parameters and assign the functionality of the relays. As all programming is done within the device, the SmartBob AO eliminates any need for additional operator interface displays or software loaded onto a PC. Once programmed, the parameters for the bin are saved in the non-volatile memory of the SmartBob AO.

Continuous Bin Level Monitoring

The SmartBob AO with built-in 4-20 mA output can easily replace any 4-20 device by simply installing the SmartBob on the top of the bin and wiring the sensor to the existing 4-20 input. When the SmartBob AO takes a measurement, it automatically transmits an updated analog signal containing the measurement data. The SmartBob AO can be programmed to initiate a measurement utilizing an internal timer to take readings at a predetermined time interval or an external start input can be used to take a measurement immediately, should one be needed. Two configurable relay outputs can be used to alert to measurement status or high, low or error alarms.

The SmartBob AO features a direct 4-20 mA analog output.

SmartBob2 AO

- **Direct 4-20 mA analog output**
- **Alternative to using consoles or software**
- **Simple user interface to configure the sensor**
- **Measures bins automatically in timed intervals**
- **Two relays configurable with four different options**
- **Initiate measurements via interval timer or external start input**
- **Two current source options for supplying power to 4-20 current loop**

SmartBob AO

BINMASTER

Simple Setup & Configuration

The SmartBob AO level sensor requires standard 115 VAC or 230 VAC power. There are two current source options for supplying power. The recommended option is to use an isolated 4-20 mA current loop which uses the PLC to provide power. Alternatively, a non-isolated 4-20 mA current loop can utilize the SmartBob sensor to provide power for the loop.

Configurable Relays

Select any two!

1. Measurement status
2. High level alarm
3. Low level alarm
4. Error alarm

Seven Simple Settings

Takes just minutes!

1. Interval timer
2. Units of measure
3. 4 mA drop distance
4. 20 mA drop distance
5. Maximum drop distance
6. Relay 1 function
7. Relay 2 function

Level & Status Data

The SmartBob AO features two relays that are configurable by the user. There are four different relay options that can be selected in any combination including measurement status (measurement in process), high level alarm, low level alarm or error alarm (Bob did not take a measurement). Other competitive devices only feature a single relay option, making the SmartBob AO more flexible by providing additional status data to the user. Other benefits of the SmartBob AO include the output of a 22 mA error signal if the SmartBob AO should encounter a “stuck top” or “stuck bottom” condition and a soft start feature that reduces wear on the motor.

The interval timer is used to program the SmartBob AO to initiate a measurement in pre-determined time intervals such as every two, four or eight hours. An external start input can be used to initiate a measurement on demand. Additionally, an override input feature can be used to turn the measurement feature off, disabling the measurement function. The override feature is useful when filling tanks to avoid covering the SmartBob probe with material or to stop measurements when a bin is undergoing maintenance or cleaning.

BINMASTER®

Powerful. Reliable. Affordable.

- The strongest, smartest inventory measurement system on the market
- Measures solids, powders, liquids or slurries
- Minimal contact with stored material
- Service and maintenance-friendly in vessels up to 180 feet
- Sleek, robust, and lightweight housing
- Approved for hazardous locations
- No field calibration or adjustment
- Trouble-free mounting
- Wireless communication options available
- Easily scalable communication capabilities to meet your operational goals

SMART Bob 2

A powerful innovation in silo inventory measurement

eBob

PC-Based Inventory Tracking Software

The future of inventory tracking

SmartBob2 Introduction

The powerful and robust design of the SmartBob2 provides years of maintenance-free service in vessels up to 180 feet.

Measuring polystyrene in a polymer manufacturing facility.

Measuring corn in a grain storage silo.

Measuring carbon black in a rubber belt plant.

Measuring sawdust at a wood product manufacturing facility.

Measuring salt submersed in water in a brine tank.

Robust SmartBob2 design

The SmartBob2 sensor combines technological advances and common sense to give you the strongest and smartest inventory measurement system on the market. The powerful and robust design of the SmartBob2 provides years of maintenance-free service in vessels up to 180 feet. It's built tough to succeed in demanding applications where other technologies fail.

Real smart

We've refined our technology and designed new innovations into the SmartBob2 to create a significantly advanced inventory measurement system. Through digital signal processing and advanced electronics, SmartBob2 gives you more communication options than any other system. We've made the best inventory measurement system even better, providing the most cost-effective and easiest-to-implement solution for maximizing your inventory control.

And versatile, too

SmartBob2 can handle the demands of virtually any application and vessel type. With numerous sensor probe styles, the SmartBob2 effectively measures solids, powders, liquids, or slurries. With a variety of mounting accessories, SmartBob2 can be used with almost any configuration of silo, bin, or other bulk storage vessel.

Proven applications

SmartBob2 has measured it all. Whether it's chunk coal in a coal-fired power plant or fine granular solids in a plastic processor's material storage silo, SmartBob2 has the power and flexibility to handle it. Airborne dust, noise, steam, temperature, or varying material characteristics pose no problem to SmartBob2. It's capable of measuring all your liquids, large granular, powders and dry bulk solids applications. A high temperature model is also available for applications where the process temperature is between 240° F and 500° F. This high temperature model is built with components designed to safely operate in temperatures up to 500° F.

A trusted name

SmartBob2 has been developed by BinMaster, the proven, trusted name in inventory measurement systems. BinMaster employees put the needs of our customers at the center of all we do. We're proud of our 40-year history of service, quality, and integrity.

How SmartBob2 works

When a SmartBob2 positioned on the top of a vessel is asked to take a measurement, a heavy-duty motor releases a strong, stainless steel aircraft cable from the supply pulley and a weighted sensor probe quickly descends to the surface of the material.

During the descent, the SmartBob2 measures the cable dispensed by counting pulses with a high resolution micro-controlled optical sensing system. When the sensor probe touches the material surface, pulses are momentarily stopped and measurement information is transmitted. The absence of pulses also causes the motor to reverse and retract the sensor probe. A second confirming measurement is taken as the probe retracts and is compared to the descend measurement.

As the probe is retracted, motor torque is automatically reduced during the last 12" of the retract cycle resulting in a "soft retract seating," which extends the life of the SmartBob2 and ensures proper cable spooling.

Outstanding performance and durability built into every aspect of the SmartBob2

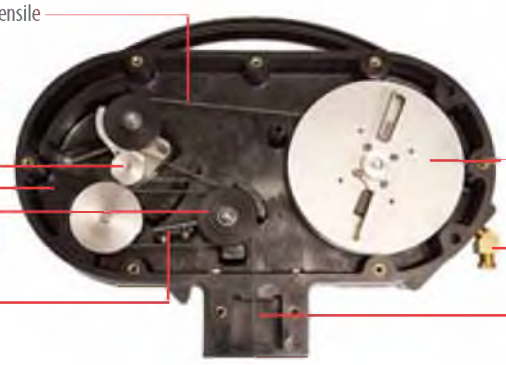
Numerous features in the design and construction of the SmartBob2 lead to its unsurpassed performance and exceptional durability.

Measuring heated molasses at a liquid feed plant.

Dual-compartment design

First among these is the innovative dual-compartment design of the SmartBob2. The mechanical compartment is completely separated from the fully-sealed electronic compartment. This protects the electronics from dust, debris, condensation and other contaminants, providing exceptional reliability and significantly extending the life expectancy of the unit. This signature feature is found on no other bob. The housing is also rated for hazardous locations.

Mechanical features



- Stainless steel nylon-jacketed cable with 270 lb. tensile strength, stronger than any brand on the market
- Idler arm brake with adjustable spring tension stops sensor probe from sinking or sliding down the angle of repose in active vessels
- Captive pulley system eliminates cables from jumping off pulleys
- Sealed bearings for trouble-free operation
- Pulley channel scraper keeps pulley channels free of foreign materials
- Cable-leveling supply pulley ensures proper cable wrapping and eliminates overlap
- Standard air purge connection to ensure performance in extremely harsh environments
- Four cleaning brushes wipe cable to keep debris out of mechanism (removable plate for easy access)

Electronic features

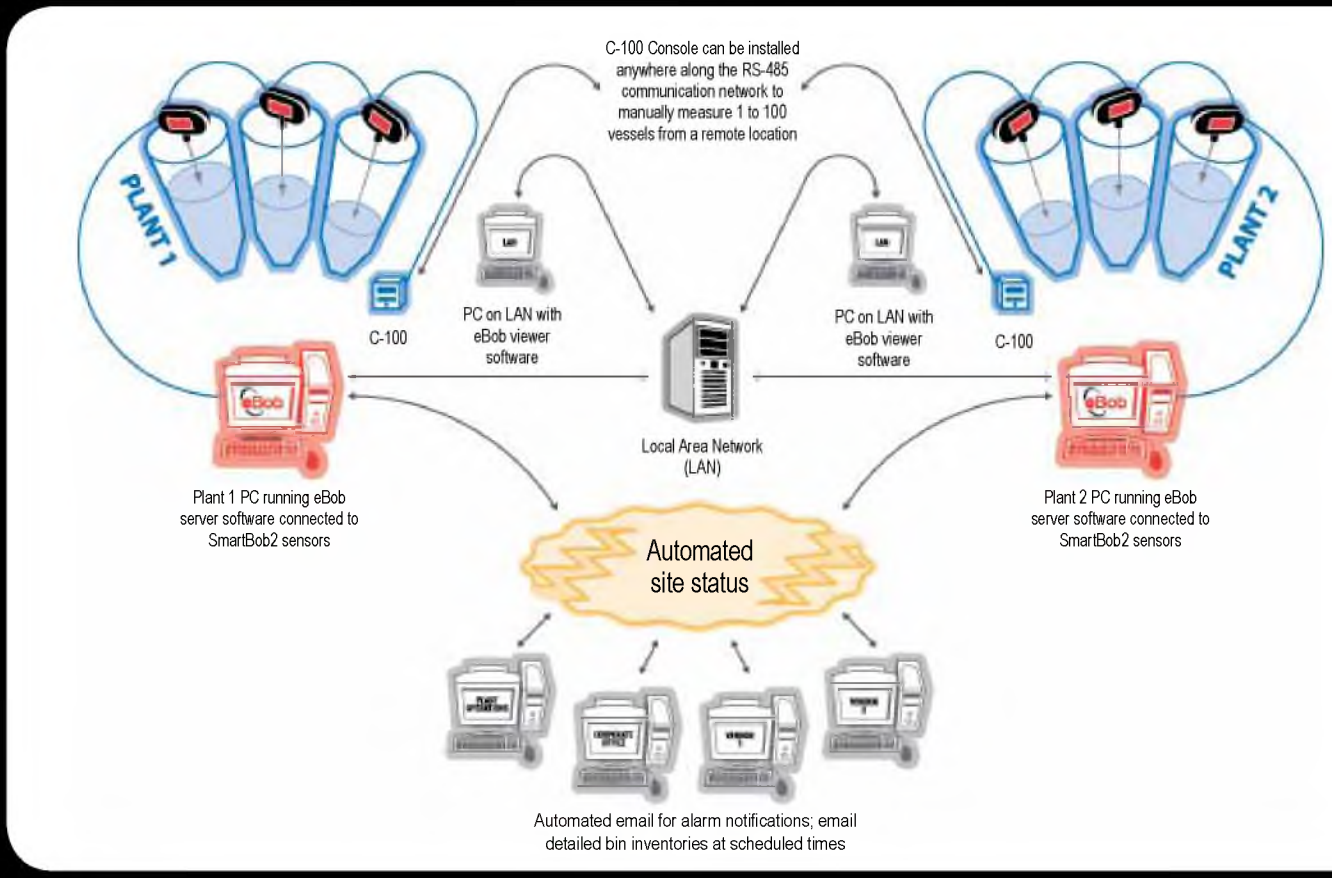
- Heavy duty direct drive reversible motor with electronic torque control provides maximum pull strength
- Optional motor gearbox heater keeps motor operating at peak performance in cold climates
- Dual conduit entries
- Powered by 110/220 VAC or 24 VDC
- Removable wire terminals simplify installation
- Test button to remotely initiate measurement
- Dip switch panel to set each remote with a unique address
- Protected optical encoder and sensor wheel

SureDrop

BinMaster's new SureDrop cable release system eliminates the sensor probe from sticking due to material buildup or freezing. The Teflon® cap and lower Teflon® ball seal the SmartBob2 mechanical cavity completely eliminating problems created by dust contaminating the unit when it's not taking a measurement. Should the Teflon® cap stick when a measurement cycle is initiated, the sensor probe will begin to descend and the ball that's crimped to the cable directly above the cap will drop and strike the cap with the full weight of the sensor probe to dislodge it. The top Teflon® ball protects the cable and crimp.

eBob

eBob PC-based inventory tracking software was developed exclusively for use with SmartBob2 sensors.



Manage critical inventory levels efficiently with real-time data on-demand

Improve your efficiency and optimize inventory levels with accessible real-time data. The powerful eBob information management system communicates preset or on-demand readings to any authorized PC loaded with eBob software.

Remote and vendor managed inventory

Remote Managed Inventory (RMI) provides a more efficient method of product management between a supplier and customer. The use of a remote managed inventory system to monitor and control the usage of raw materials has brought important real-time benefits to a wide range of industries, especially where bulk materials and liquids are a vital part of their process. This system allows vendors to keep a constant check on supplies of raw material at a particular customer site. By studying trends in usage, they can optimize their manufacturing schedules to meet expected demand and forward plan their delivery logistics. Vendor Managed Inventory (or VMI) is the process in which a vendor assumes responsibility for managing the inventory of a product at a customer's site. Timely inventory and usage data is essential to the Vendor Managed Inventory process.

The eBob software provides the real-time inventory and usage data and the SmartBob2 sensor is a widely accepted method of reliably measuring bulk materials and liquids.

Completely customizable

Gather data from 1 to 100 SmartBob2-monitored vessels, at any number of locations. Configure your system to match your operational specifications so you can instantly share information with managers or vendors at multiple locations silo-by-silo, by vessel groups, or on a consolidated basis.

Simple, affordable, easy-to-use solution

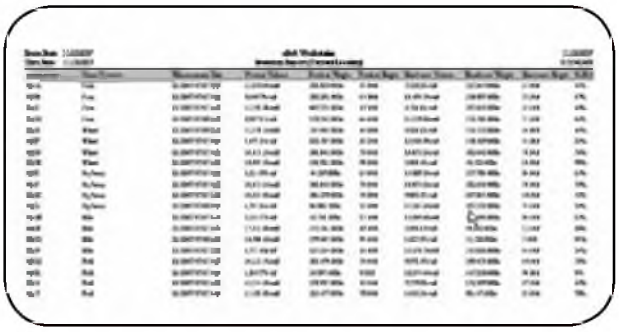
The eBob system offers affordable solutions for any size application. Simple software is installed at a single site and can be up and running quickly. Open system design is easy to use and supports convenient data transfer.

eBob gathers critical data from SmartBob2 sensors

The SmartBob2 offers proven, reliable, accurate inventory measurements of solid, liquid, and slurry material. The robust design of the remote sensor will provide years of maintenance-free service in vessels up to 180 feet.

Discover the Power of eBob

eBob software system is a powerful innovation in silo inventory management.



BinMaster is your single source

The eBob software has been developed by BinMaster, the proven, trusted name in inventory measurement systems. BinMaster is your single source for customization, support, and upgrades—there are no third party applications, no monthly access fees, and no special training or support required.

Discover the power of eBob

The eBob software is a powerful innovation in silo inventory management. The eBob allows inventory tracking from any local PC loaded with eBob software. The eBob software gathers data from our SmartBob2 sensors to monitor inventory levels in up to 100 vessels.

The powerful software provides an unsurpassed graphical representation of critical inventory data, including:

- vessel number and group (view data for up to 16 vessels at one time)
- vessel contents and title
- distance to product (headroom)
- height of product
- vessel percent full
- product weight
- product volume
- date/time of last and next measurement
- status of measurement device (descending, retracted, inactive, plus error messages)
- strapping tables for non-linear vessels.

A second detail screen provides an expanded data readout for any individual vessel.

Automatic measurements

The eBob system can be programmed to take automatic measurements at preset intervals and allows you to send vital information via email.

Vessel shape correction

When the SmartBob2 sensor measurement exceeds the straight wall vessel height, a cone volume correction can be set up. The correction factor models the cone section of a vessel by applying a height and radius to multiple "bands" or sections of the cone and subtracting this from the overall volume. Alternatively, cone volume correction can be done by entering data into a strapping table.

Automatic alerts

Alarm settings provide automatic notification alerts via email if critical inventory levels are reached.

Data history and trending

Microsoft® Access compatible files store current and historical measurement data. All data can be easily transferred to other software programs for data analysis or archiving. A basic reporting screen provides comprehensive data from the last measurement of each vessel. A string report is also available to show a history trend of the past 30 measurements for each vessel.

Access vessel data instantly with the C-100 Console

The C-100 Console is the most popular way to remotely initiate and view vessel measurements.

Whether you use SmartBob2 sensors with or without the eBob software , the C-100 Console gives you instant measurement readings with the push of a button. This compact, manually-operated console can control from 1 to 128 SmartBob2 sensors.

When you are using the eBob software, there are still times you may want to initiate readings independently from a remote location–such as a truck load out station. You can make numerous measurements without affecting the eBob software's long-term data memory or trending information.

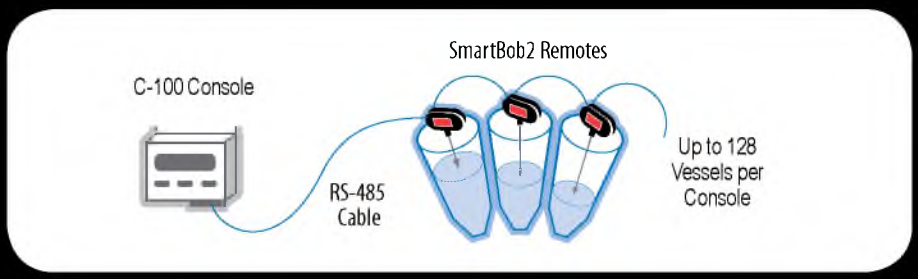
Individual bin heights are programmed into the C-100 Console and measurements are displayed as distance to product, height of product, and percent full. The display also indicates the status of the Bob during the measurement cycle. Most recent bin heights and percent full data is retained in the C-100 Console's memory, even in instances of power loss.

Communication Accessories

Remotely initiate and view vessel measurements.

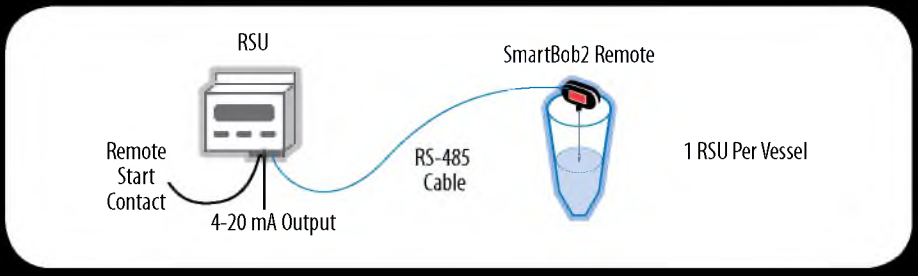
C-100 push button console

The C-100 Console is the simplest way to remotely initiate and view vessel measurements. This compact, manually-operated console can control from 1 to 128 SmartBob2 sensors with the push of a button. Individual bin heights are programmed into the console and measurements are displayed as distance to product, height of product, and percent full. The display also indicates the status of the Bob during the measurement cycle. Bin heights and percent full data of the most recent measurements are retained in the C-100 Console's memory, even in instances of power loss. A C-100 MB option allows control of a SmartBob sensor network via a Modbus interface.



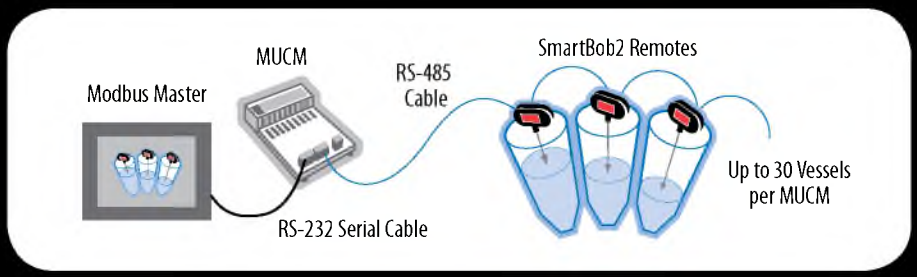
Remote Start Unit (RSU)

The RSU provides a variety of enhancements to the SmartBob2 system: an external start input, a 4-20 mA current loop (analog) output, and a remote display or remote readout of the measurements. These enhancements allow for a simple interface between the SmartBob2 Sensor and Programmable Logic Controllers (PLC) or Distributed Control Systems (DCS). The PLC \ DCS can initiate a measurement by providing a dry contact closure to the RSU. The PLC can then retrieve the measurement from the analog 4-20 mA current loop output on the RSU. The remote readout feature allows you to view the current measurement information at each vessel or in a control room away from the controlling PLC or DCS. The display provides distance to product, height of product, percentage of product in the storage vessel, and status of the Bob. The most recent measurement and user information is stored in non-volatile memory (data is retained even in event of power loss).



SmartBob2 MUCM communication module

The MUCM is a communication module capable of translating the SmartBob2 serial protocol to Modbus RTU, Ethernet, DeviceNet™, Modbus Plus™, or Profibus protocols. The example below shows a Modbus serial master gathering data from three SmartBob2 Sensors. The data from each SmartBob2 sensor is presented as a Modbus Holding Register (4x). Each Bob is assigned a unique Modbus slave address. A special Modbus slave address of 247 is provided to initiate a measurement and to give a summary of all the measurements from the SmartBob2 Remotes in the network.



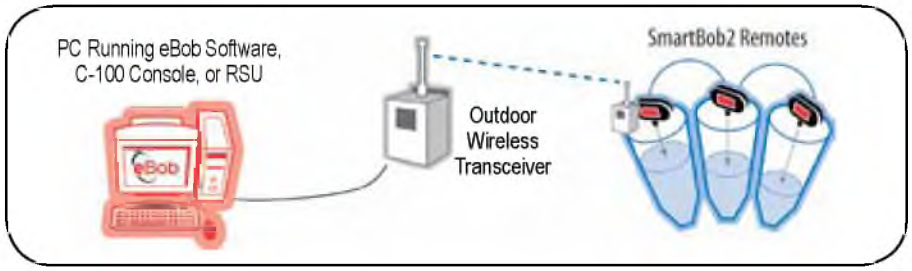
C-50 analog expansion console

The C-50 Analog Expansion Console interfaces with the C-100 SmartBob Control Console to provide multiple 4-20 mA outputs, enabling monitoring of multiple bins equipped with SmartBob2 or SmartBob-TS1 sensors from a single C-100 SmartBob Console. The C-50 Analog Expansion Console connects to the C-100 SmartBob Console via a dedicated RS-485 cable. Then, the C-100 SmartBob Console is connected via a daisy chained RS-485 network to monitor from 1 to 120 SmartBob sensors.

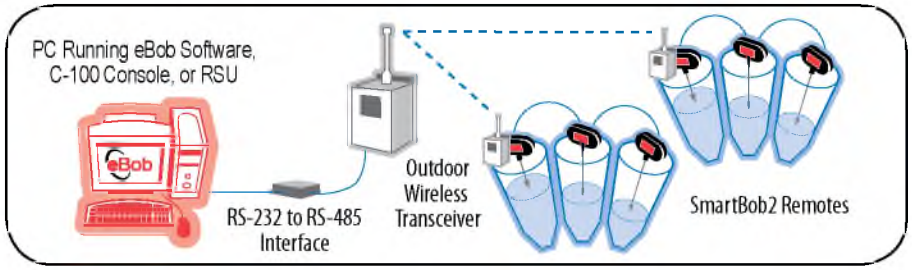
Wireless data transmitters

BinMaster's wireless data transceiver eliminates the need for running long spans of communication cable by providing affordable, two-way wireless data communication between SmartBob2 sensors mounted high on top of storage vessels and a control source on the ground. BinMaster's long-range wireless data transceiver operates in the license-free portion of the FCC designated industrial frequency band at 900 MHz. Designed to work in high interference environments, the wireless transceivers combine advanced frequency hopping and digital signal processing technology with outstanding receiver sensitivity and antenna diversity, resulting in exceptional noise and interference rejection and peace of mind for you. Wireless data networks can be effective in new SmartBob2 installations, as an alternative to wired connections. They can also be used to expand the capabilities of existing systems.

A Point-to-Point single network wireless solution eliminates running RS-485 communication cable from the control source on the ground to the first SmartBob2 sensor in a single grouping of vessels.



A Multi-Point single network wireless solution eliminates running RS-485 communication cable from the control source on the ground to the first SmartBob2 sensor in multiple groups of vessels.



316 stainless steel spike sensor probe

The spike is designed for solid materials with a bulk density greater than 20 lb./cu. ft. The spike can also be used to torpedo through a liquid to find and measure a submersed solid in an interface application. This spike works well in corrosive materials and foodstuffs. A Teflon® coated spike is available for sticky materials. This spike is also available in 416 stainless steel to allow it to be picked up by a magnet.

316 stainless steel sphere float

The sphere float is designed for liquid, slurry and light powder applications.

Digestible bottle

Polyethylene bottle can be purchased empty and filled with material compatible with the material stored in the vessel or filled at the factory with a food grade paraffin wax. It's called a "digestible" bottle because it can pass easily through a rotary valve or screw conveyor.

4" inverted stainless steel cone

The 4" inverted stainless steel cone is hollow and designed for use with light solids and powders with a bulk density greater than 8 lb./cu. ft. Stainless steel construction offers long life even in corrosive materials and foodstuffs. A Teflon® coated cone is available for sticky materials.

6" inverted stainless steel cone

This hollow inverted stainless steel cone is designed for use in liquids or light bulk solids and powders with a bulk density greater than 3 lb./cu. ft. This sensor probe works well in corrosive materials and foodstuffs. A Teflon® coated cone is available for sticky materials.

Mounting flanges

SmartBob2 sensors can be ordered with flat- or angled-mount flanges for mounting on sloped roof vessels. The flanges are available in 0°, 5°, 10°, 15°, 20° and 30°.

Gearbox heater

SmartBob2 can be ordered with a motor gearbox heater and thermostat when the SmartBob2 Remote will be exposed to temperatures consistently below 32° F. The heater will assure the motor operates at 100% efficiency.

Pipe extension

The pipe extension is an optional feature that is attached to the SmartBob2 mount. The pipe extension keeps the sensor probe from being pulled up into a standpipe, functions as a bushing, and keeps the cable from fraying on sharp objects. It also functions to keep the sensor probe flush with the vessel top. The extension pipes are available in CPVC, galvanized, or stainless steel. They are available in custom lengths from 4 inches to 20 feet.

Innovative SmartBob Design for Side Mounting

The SmartBob HM is an innovative version of BinMaster's proven SmartBob weight-and-cable based level sensor for mounting on the side of the bin, tank or silo. The SmartBob HM – for horizontal mount – can be used when it is not possible to install the sensor on the top of the bin. The SmartBob HM features a rigid extension that is custom-made from 12" to 36" long to install on the side of the bin through a 4" opening. Precise level measurements are taken at pre-determined time intervals at a location directly below the probe to continuously monitor the inventory of material inside of the bin.

Designed and Manufactured in the USA

- Side mounts on the bin when top mounting isn't possible
- Rigid extension custom-made in lengths from 12" to 36"
- Installs through a 4" opening
- Automatically measures at scheduled time intervals
- Data is sent to a control console or to eBob software on a PC
- For powders and bulk solids stored in bins, tanks or silos
- Listed for Class II, Groups E, F & G for hazardous location

Automated Measurement Simplifies Inventory Management

The SmartBob HM continuous level sensor works like an automated tape measure, but eliminates the need to climb bins for manual measurements to reduce the risk of accidents in the workplace. Like all models of SmartBob sensors, it helps save time, money, and increase employee safety by sending level measurement data directly to a control console or eBob software installed on a PC. It is listed for Class II, Groups E, F & G and enclosure types NEMA 4X, 5 and 12, ensuring the sensor is safe to use in locations where combustible dust may be present. It can be used in a mixed network of SmartBobs that are installed on the top of the bin or are monitoring other materials for a complete inventory management solution.

SmartBob HM for Horizontal Mounting

BINMASTER®

MADE IN USA

SBHM-0115-NPC ISO 9001:2008 Certified

Measures Submersed Solids Under Water

BinMaster's SmartBob inventory measurement system offers a SmartBob2 SS sensor option, which is a proven solution when the requirement is to measure the level of solid material below a liquid surface, such as in brine interface applications. It can be used in tanks where solid material settles at the bottom of a tank, such as for measuring the level of settled salt, sediment, sand or metals under water. The SmartBob SS is an excellent alternative to relying on sight tubes and can be used in any application where solid material needs to be measured under liquid. Examples include water treatment, wastewater facilities, food processing, petroleum refining, chemical processing, and salt and metal mining.

Accurate Measurements without Climbing Tanks

The SmartBob SS sensor eliminates the need to climb tanks to get measurements. The weighted probe drops through the liquid and when it comes into contact with solid settled material, it retracts and sends a measurement to a SmartBob control console or a PC loaded with eBob software. It also features a 4-20 mA analog output from a console that can record the measurement directly to an existing control system or send data to a PC running a data logging program using RS-485 communications. The SmartBob SS sensor's design includes a standard air purge fitting that can be plumbed to add dry air and help keep the sensor cavity dry. The SmartBob SS is fitted with either a stainless steel, Teflon-jacketed cable or a durable nylon cable with stainless fittings that stands up to corrosive materials.

SmartBob SS

BINMASTER®

SmartBob SS for Submerged Solids

The SmartBob2 SS for measuring submersed solids is an affordable measurement system that provides the level of solid materials that have settled on the bottom of a tank of liquids. The SmartBob SS sensor mounts on the top of the bin and works like an automated tape measure. The SmartBob sensor operates by dropping a cable with a weighted stainless steel probe that penetrates the liquid and descends to the solid material surface in the tank. When the probe comes into contact with the solid material, it automatically retracts and sends a measurement to a either a C-100 control console mounted at ground level or to a personal computer loaded with eBob software. A standard 4-20 analog output can also be used to send data directly to an existing control system from the C-100.

Accurate, Real-Time Measurements

The control console reports the distance to the solid material (headroom), height of the solid material, and percentage the tank is full of solid material. One control console can monitor one bin or can be networked to report information from up to 128 tanks to one console. Sending all information to a single console eliminates the need to climb bins to check tank levels or walking from one bin to the next. Each tank is assigned a number and the tank parameters including the height and diameter for each bin are entered into the console using a push-button key pad. Measurements are taken by selecting the tank to be measured, pressing a button, and the measurement is promptly taken and displayed on the console. The tank height and diameter information as well as the last measurement taken are retained in the console's memory, even in the event of a power loss. The console is contained in an impact resistant enclosure and is installed in a metal electrical box or cabinet.

Solutions for Multiple Tank Operations

If the operation has multiple tanks in multiple locations, BinMaster offers the C-50 analog expansion console to accommodate multiple analog outputs for one up to 120 tanks. The C-50 analog expansion console interfaces with the C-100 control console to provide multiple 4-20 mA outputs, enabling monitoring of multiple tanks equipped with SmartBob SS sensors from a single C-100 console. Another multiple bin monitoring alternative is eBob software which is loaded on a PC and allows for tank measurements to be viewed on a computer screen inside an office. The Windows-compatible software enables viewing of up to 16 tanks at a time and for color-coding of tanks by material or tank location. eBob can be set up to send automated email alerts if tanks get below or above a preset level. eBob software is easy to use and requires no special training or support.

BINMASTER®

Inventory Measurement System

Compact. Reliable. Affordable.

- New compact and lightweight design for vessels up to 60 feet
- Weighs less than 10 pounds
- Compatible with the SmartBob2 system consoles and software
- Measures solids, powders, liquids or slurries
- Minimal contact with stored material
- Built-in wireless communication option
- Service and maintenance-friendly
- Trouble-free mounting on angled or flat roofs
- Scalable communication capabilities to meet your operational needs

SMART Bob TS1

eBob **Real-Time Inventory Tracking Software**

The future of inventory tracking

SmartBob-TS1 Introduction

SmartBob-TS1 tank sensor provides years of maintenance-free service in vessels up to 60 feet.

Designed for smaller vessels

The SmartBob-TS1 sensor is an economical and compact inventory tracking system that has been designed for use in smaller tanks and silos. The small yet rugged design allows you to use SmartBob-TS1 in vessels up to 60 feet tall.

Reliable under difficult conditions

The SmartBob-TS1 delivers reliable level data in applications where other technologies simply won't work. SmartBob-TS1 has become widely accepted as the standard measuring technology for reliable measurement of bulk solids. The SmartBob-TS1 measuring principle combines reliability with simplicity in a wide variety of applications.

- High resolution microcontrolled optical sensing system
- Heavy duty direct drive reversible motor with electronic torque control provides maximum pull strength
- Optional built-in 900 MHz wireless modem
- Dual-sided idler arm eliminates any slack in cable and stops cable from jumping off pulleys
- Braided nylon cable, designed for the toughest applications
- Rotational molded polyethylene housing
- Fully sealed compartments protect the electronics from dust, debris, condensation and other contaminants

Real smart

The SmartBob-TS1 is compatible with its predecessor the SmartBob2, which can be used in bins up to 180 feet tall. This allows you to combine the two sensors into one common system. We've made the best inventory measurement system even better, providing the most cost-effective and easiest-to-implement solution for maximizing your inventory control.

And versatile, too

SmartBob-TS1 can handle the demands of virtually any application and vessel type. With numerous sensor probe styles, the SmartBob-TS1 effectively measures solids, powders, liquids, or slurries. With a variety of mounting accessories, SmartBob-TS1 can be used with almost any configuration of silo, bin, or other bulk storage vessels.

Proven applications

Whether it's ground feed in a silo on a farm or fine granular solids in a plastic processor's material storage silo, SmartBob-TS1 has the power and flexibility to handle it. Airborne dust, filling noise, steam, temperature, or steep coned bottoms pose no problem to SmartBob-TS1. It's capable of measuring all your liquids, large granular, powders and dry bulk solids.

How SmartBob-TS1 works

When a SmartBob-TS1 positioned on the top of a vessel is asked to take a measurement, a rugged motor releases a nylon cable from the supply pulley and a weighted sensor probe descends to the surface of the material.

During the descent, the SmartBob-TS1 measures the cable dispensed by counting pulses with a high resolution microcontrolled optical sensing system. When the sensor probe touches the material surface, pulses are momentarily stopped and measurement information is transmitted. The absence of pulses also causes the motor to reverse and retract the sensor probe. A second confirming measurement is taken as the probe retracts and is compared to the descend measurement.

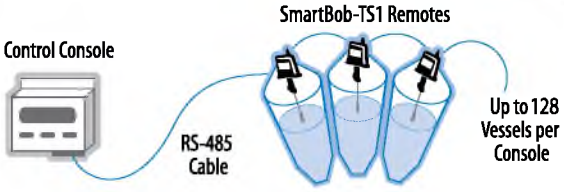
As the probe is retracted, motor torque is automatically reduced during the last 12" of the retract cycle resulting in a "soft retract seating" which extends the life of the SmartBob-TS1 and ensures proper cable spooling.

Remotely initiate and view vessel measurements.

Communication Accessories

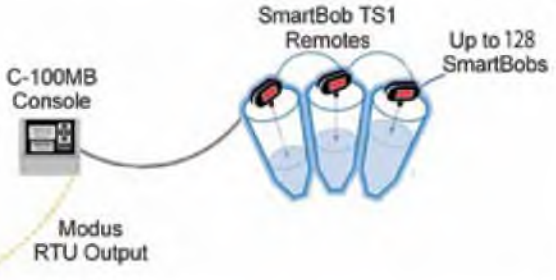
Control Console (C-100)

This compact, manually operated console can control up to 128 SmartBob-TS1 sensors with the push of a button. Individual bin heights are programmed to the console and measurements are displayed as distance to product, height of product, and percent full.



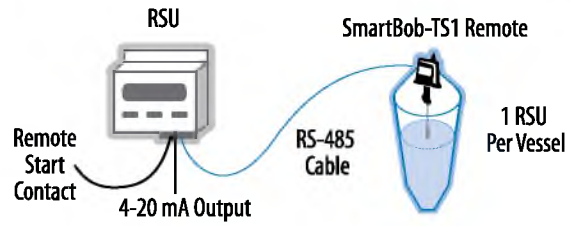
Modbus Control Console (C-100MB)

The BinMaster C-100MB is a compact control console that allows control of a SmartBob sensor network via a Modbus interface, simplifying bin inventory management for organizations that utilize the Modbus communication protocol routinely in their operations. The C-100MB console provides an RTU (remote terminal unit) output to a PLC (programmable logic controller) or HMI (human machine interface).



Remote Start Unit (RSU)

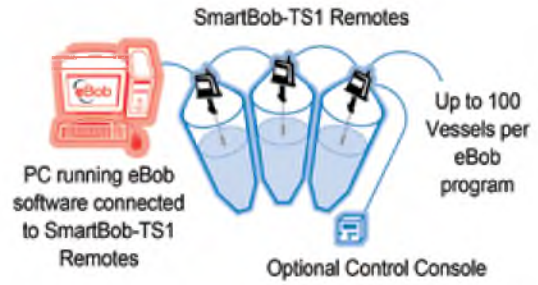
The RSU provides an external start input, a 4-20 mA current loop output, and a remote read-out of the measurement. The RSU allows for a simple interface between the SmartBob-TS1 sensor and a PLC or DCS system. The PLC/DCS initiates the measurement by providing a dry contact closure and then can retrieve the measurement from a 4-20 mA output.



eBob Software

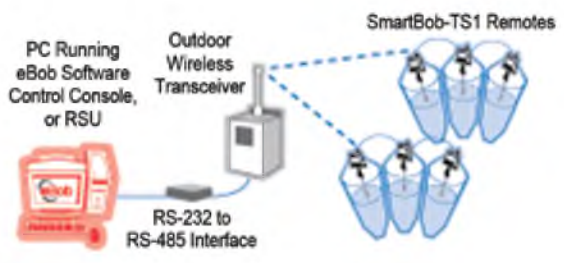
The eBob software allows convenient inventory tracking from a PC inside an office. The eBob software gathers data from up to 100 SmartBob-TS1 sensors. The powerful software provides an unsurpassed graphical representation of critical inventory data, including:

- Vessel number
- Contents and title
- Headroom
- Height of product
- Percent full
- Product weight
- Product volume
- Status
- Date/time of measurement



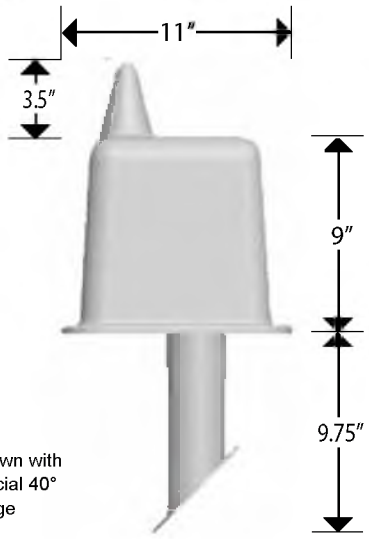
Wireless Data Transmitter

Eliminates the need for running long spans of communication cable by providing two-way wireless data communication between SmartBob-TS1 sensors mounted on top of storage vessels and the control source on the ground. A wireless modem can be installed in one SmartBob-TS1 per group and the remainder of the sensors hardwired. Or, wireless modems can be installed in all SmartBob-TS1 sensors.

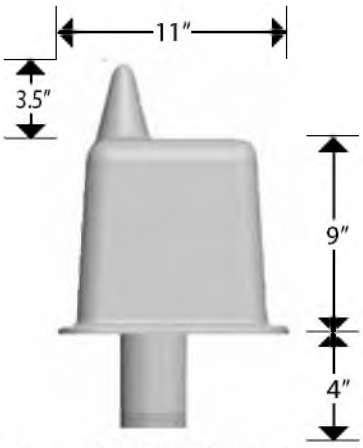


Specifications/ Accessories

Power Requirements: 115 VAC 60Hz
Power Consumption: 21 VA Continuous 37 VA intermittent
Current Draw: @115VAC: 0.18 A Continuous 0.32 A intermittent
Temperature: -20° F to +140° F (-28° C to 60° C)
Measurement Range: 60 feet maximum
Accuracy: ± 0.25% distance measurement accuracy
Resolution: 0.1 ft (0.03 m)
Communication: RS-485 Half Duplex
Wiring Distance: 4,000 ft (1220 m)
Enclosure: Rotational molded polyethylene
Mounting: Special bolt on and 3″ NPT
Conduit Entry: Two 3/4″
Weight: 9.6 lbs
Cable: Braided nylon



* Shown with special 40° flange



* Shown with straight 3" NPT standpipe to fit the 0°, 5°, 10°, 15°, 20°, and 30° mounting flanges

30° & 40° mounting flange

SmartBob-TS1 sensors can be ordered with special mounting brackets to easily install on smaller feed bins with steep angled roofs. These flanges can be bolted directly to the roof. The flanges are available in 30° and 40°.

Flat & angled mounting flange

SmartBob-TS1 sensors can be ordered with flat or an angled mount flange for mounting on sloped roof vessels. The flanges are available in 0°, 5°, 10°, 15°, 20° and 30°.

Digestible bottle

Polyethylene bottles can be purchased empty or filled with materials compatible with the material stored in the vessel, or filled at the factory with a food grade paraffin wax. It's called a "digestible" bottle because it can pass easily through a rotary valve or screw conveyor.

Pipe extension

The pipe extension is an optional feature that is attached to the SmartBob-TS1 mount. The pipe extension keeps the sensor probe from being pulled up into a standpipe, functions as a bushing, and keeps the cable from fraying on sharp objects. The extension pipes are available in CPVC, galvanized, or stainless steel.

6" stainless steel float

This hollow inverted stainless steel sphere is designed for use in liquids or light, bulk solids and powders with a bulk density greater than 3 lb./cu. ft. This sensor probe works well in corrosive materials and foodstuffs.

Gearbox motor heater

SmartBob-TS1 can be ordered with a motor gearbox heater and thermostat when the SmartBob-TS1 sensor will be exposed to temperatures below 32° F. The heater will assure the motor operates at 100% efficiency.

Polyethylene weighted spike

This spike is designed for solid materials with a bulk density greater than 20 lb./cu.ft.

PULSE RADAR

ULTRASONIC

BINMASTER

Taking Control...To A Higher Level

SmartSonic & SmartWave Level Systems

BINMASTER

SmartSonic and SmartWave are for continuous non-contact level measuring and monitoring of tanks, bins, and silos. The SmartSonic features a variety of ultrasonic transmitters and the SmartWave features a variety of pulse radar transmitters, both with broad processor capabilities that provide remote display and full communication solutions. This plug-and-play design allows us to build a solution that matches your exact needs and is fully scalable for future expansion.

SmartSonic generates an ultrasonic pulse that is sent in the direction of the product in a vessel. The pulse reflects off the product and returns to the sensor in the form of an echo. SmartWave generates an electromagnetic pulse that travels to the surface being monitored and is reflected off the surface back to the sensor. Both transmitters can be programmed to simply send a 4-20 mA analog output signal directly to an existing control system or send data to a PC running a calibration/data logging program using RS-485 communications.

You have bulk-management challenges.
We have bulk management solutions.
Simple as that.

General Features

- **Modular Design**
  Configurable for a number of transmitters, relays, current loops, PC, and PLC interfaces
- **Various Voltage Options**
  Transmitters can be powered with 12 to 30 VDC or 110/230 VAC
- **Push-Button Calibration**
  Full and empty tank distance can be set with a simple push of a button
- **Temperature Compensation**
  Built-in temperature sensor automatically compensates for temperature changes, ensuring consistent accuracy
- **Optional RS-232/485 Communications**
  Interfaces directly to a PC allowing for data collection, parameter changes, and transmitter diagnostics

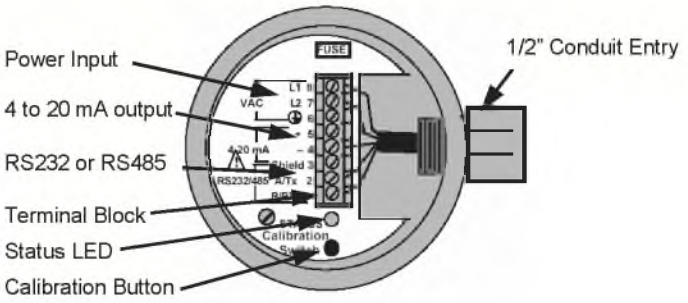
SmartSonic Ultrasonic Transmitters

1-800-278-4241

Features

- Power control operation in transmitter
- Easy two point push-button calibration
- Output 4 to 20 mA signal
- Built-in temperature compensation
- Optional RS-232 or RS-485 communications
- Logarithmic receiver with very high dynamic range
- Uniform polar pattern
- Self-cleaning operation

Top View of Transmitter with Access Cover Removed



Technical Specifications

	MODEL	RANGE	RESOLUTION	MOUNTING
110/230 VAC—4 Wire	SS400-25U & UC	1.4-90 ft 0.40-27.4 m	0.41" 10 mm	6.0"/1.0" NPT
	SS400-45U & UC	1.0—60 ft 0.30—18.2 m	0.19" 5 mm	3.0" NPT
	SS400-52U & UC	0.9—50 ft 0.27—15.2 m	0.16" 4 mm	3.0" or 2.0" NPT
	SS400-70U & UC	0.8—30 ft 0.24—9.1 m	0.12" 3 mm	3.0" or 2.0" NPT
	SS400-80U & UC	0.7—20 ft 0.21—6.1 m	0.08" 2 mm	3.0" or 2.0" NPT
	SS400-81U & UC	0.6—16 ft 0.18—4.9 m	0.08" 2 mm	3.0" or 1.5" NPT
	SS400-148U & UC	0.4—9 ft 0.12—2.7 m	0.04" 1 mm	3.0" or 1.0" NPT
12 to 30 VDC—3 Wire	SS300-25U & UC	1.4-90 ft 0.40-27.4 m	0.41" 10 mm	6.0"/1.0" NPT
	SS300-45U & UC	1.0—60 ft 0.30—18.2 m	0.19" 5 mm	3.0" NPT
	SS300-52U & UC	0.9—50 ft 0.27—15.2 m	0.19" 5 mm	3.0" NPT
	SS300-70U & UC	0.8—30 ft 0.24—9.1 m	0.12" 3 mm	3.0" or 2.0" NPT
	SS300-80U & UC	0.7—20 ft 0.21—6.1 m	0.08" 2 mm	3.0" or 2.0" NPT
	SS300-81U & UC	0.6—16 ft 0.18—4.9 m	0.08" 2 mm	3.0" or 1.5" NPT
	SS300-148U & UC	0.4—9 ft 0.12—2.7 m	0.04" 1 mm	3.0" or 1.0" NPT

The new SmartSonic Transmitter features high efficiency, narrow beam design technology using a wide frequency bandwidth to enhance operation in difficult applications. The transmitter performs particularly well in harsh environments where vessel temperatures vary. Also, SmartSonic uses smart signal processing to eliminate unwanted echoes from tank walls, standpipes, and other tank structures that often cause error readings by other ultrasonic devices. The unit's transducer uses a built-in, self-cleaning operation to eliminate buildup or condensation. SmartSonic sensor probes are designed to adapt to the internal tank conditions, automatically adjusting power and receiver sensitivity to any distance and reflecting surface. This technology ensures the same echo is maintained over the entire operating range which enhances measurement accuracy.

Mechanical

Conduit Entry:
1/2" NPT (PVC conduit only)
Enclosure:
PVC-94VO
Enclosure Rating: NEMA 4X(IP65)

Environmental

Temperature:
-40 to 140° F (-40 to 60° C)
Pressure:
1 bar
Approvals:
Entela—CSA/UL

Operational

Accuracy:
+/- 0.25%
Beam Angle:
6°-12° conical at –3dB
Loss of echo: Hold 30 seconds, 22 mA
Temperature Compensation:
Continuous in transducer
Temperature Sensor Failure: 23 mA
Calibration: Push-button or programmable
via optional communication port

SmartSonic Sanitary Ultrasonic Transmitters

BINMASTER

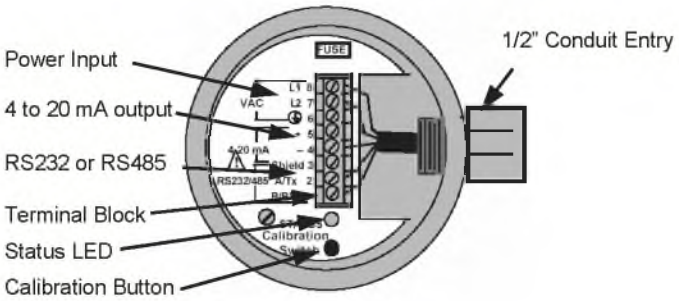
Features

- **300 series stainless steel face material c/w ferrule mounting base**
- **Easy two point push-button calibration**
- **Output 4 to 20 mA signal**
- **Built-in temperature compensation**
- **Optional RS-232 or RS-485 communications**
- **Logarithmic receiver with very high dynamic range**
- **Uniform polar pattern**
- **Self-cleaning operation**

Applications

- Food
- Beverage
- Water
- Pharmaceutical

Top View of Transmitter with Access Cover Removed



The SmartSonic Sanitary Transmitters is built specifically for Food Grade applications where Sanitary Standards apply. The transmitters will cover distances from 5" to 30' using different operating frequencies. Our sanitary ultrasonic transmitters will adapt to any condition. They control transmitter power, receiver sensitivity and reject unwanted echoes. Any buildup on the 300 series stainless steel transducer is removed by the self-cleaning operation.

Technical Specifications

	MODEL	RANGE	RESOLUTION	MOUNTING FERRULE
110/230 VAC—4 Wire	SS400-70US & USC	0.8—30 ft 0.24—9.1 m	0.12" 3 mm	2.0"
	SS400-80US & USC	0.7—20 ft 0.21—6.1 m	0.08" 2 mm	2.0"
	SS400-81US & USC	0.6—16 ft 0.18—4.9 m	0.07" 1.8 mm	1.5"/2.0"
	SS400-148US & USC	0.4—9 ft 0.12—2.7 m	0.04" 0.98 mm	1.5"/2.0"
12 to 30 VDC—3 Wire	SS300-70US & USC	0.8—30 ft 0.24—9.1 m	0.12" 3 mm	2.0"
	SS300-80US & USC	0.7—20 ft 0.21—6.1 m	0.08" 2 mm	2.0"
	SS300-81US & USC	0.6—16 ft 0.18—4.9 m	0.07" 1.8 mm	1.5"/2.0"
	SS300-148US & USC	0.4—9 ft 0.12—2.7 m	0.04" 0.98 mm	1.5"/2.0"

Mechanical

Conduit Entry: 1/2" NPT (PVC conduit only)
Enclosure: PVC-94VO
Enclosure Rating: NEMA 4X(IP65)

Environmental

Temperature: -40 to 266° F (-40 to 130° C)
Pressure: 1 bar
Approvals: Entela—CSA/UL

Operational

Accuracy: +/- 0.25%
Beam Angle: 10°-12° conical at –3dB
Loss of echo: Hold 30 seconds, 22 mA
Temperature Compensation: Continuous in transducer
Temperature Sensor Failure: 23 mA
Calibration: Push-button or programmable via optional communication port
Diagnostics:

SmartWave Pulse Radar Transmitters

1-800-278-4241

Features

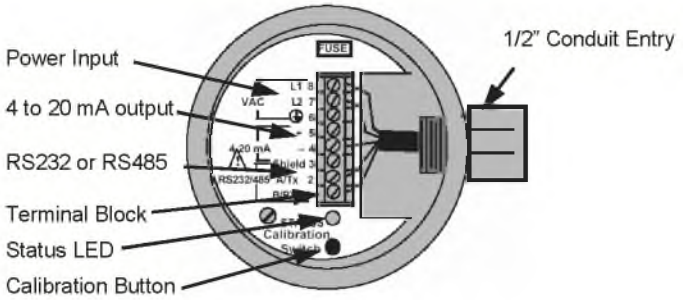
- Low Noise
- Accurate and Reliable
- High Sensitivity
- Self-adjusting amplitude and width of microwave pulse
- Easy two point push-button calibration
- Output 4 to 20 mA signal
- Optional RS-232 or RS-485 communications
- Uniform polar pattern
- No mounting influence

The SmartWave is a very accurate, noiseless and self-adjusting pulse radar transmitter for distances up to 100 feet. The SmartWave adjusts microwave pulse amplitude and its width to a target distance and target reflection properties The receiver changes its sensitivity with the amplitude of received echoes. In addition, the unit analyzes the shapes of the received echoes and eliminate the ones coming from tank walls, standpipes and other obstructions. These features allow the SmartWave to track any wanted target from the tip of the rod antenna to the bottom of the tank, regardless of the tank shape or environmental conditions.

Applications

- Food
- Beverage
- Water / Wastewater
- Chemicals

Top View of Transmitter with Access Cover Removed



Technical Specifications

	MODEL	RANGE	RESOLUTION	MOUNTING
110/230 VAC—4 Wire	SS400-050R & RC	Antenna Tip—50 ft Antenna Tip-15 m	0.22" 5.7 mm	2.0" NPT
	SS400-100R & RC	Antenna Tip—100 ft Antenna Tip-30 m	0.44" 11 mm	2.0" NPT
12 to 30 VDC—3 Wire	SS300-050R & RC	Antenna Tip—50 ft Antenna Tip-15 m	0.22" 5.7 mm	2.0" NPT
	SS300-100R & RC	Antenna Tip—100 ft Antenna Tip-30 m	0.44" 11 mm	2.0" NPT

Mechanical

Conduit Entry: 1/2" NPT
Enclosure: Aluminum-94VO (optional SS)
Enclosure Rating: NEMA 4X(IP65)

Environmental

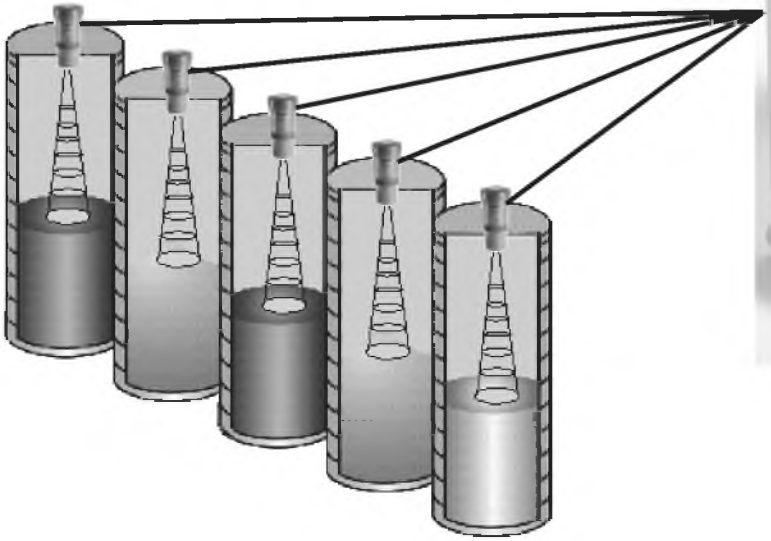
Temperature: -40 to 140° F (-40 to 60° C)
Pressure: 1 bar
Approvals: Ingress Protection NEMA 4

Operational

Operation: Pulse Radar
Frequency: 6.3 GHz
Accuracy: +/- 0.25% of maximum target range
Loss of echo: Hold 30 seconds, 22 mA
Transmitter Power: 50 uW average
Calibration: Push-button or programmable

Display Modules & Enclosure

1-800-278-4241



BinMaster SmartSonic/SmartWave Display Module Enclosure with 5 Bargraph Display Modules

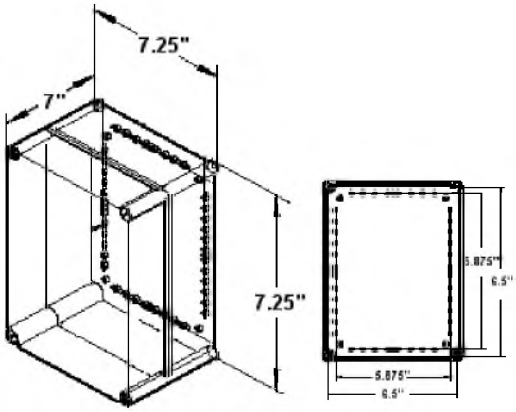
The bargraph display modules can be used with any of the SmartSonic or SmartWave Transmitters for remote indication of tank level. The display modules are available with optional relay outputs to provide process control and local alarms, and process loop analog output modules to be used to retransmit measurement data to a PLC/DCS or other analog devices.

The NEMA-4X Display Module Enclosure houses up to 5 display modules. This cabinet is made from high impact polycarbonate material and will withstand harsh industrial environments.

General Features

- Optional configurations to match your specific operational needs
- Auto-sensing AC/DC power supply for voltages between 85-265 VAC / 95-370 VDC; 15-48 VAC / 10-72 VDC
- Output options include analog current loop and relay outputs
- Optional dual set points with easy adjustment from the front of the display

Display Module Enclosure Specifications



Optional Display Modules

A Versatile, Modular Bargraph Display with Optional Dual Setpoints and Relay Outputs

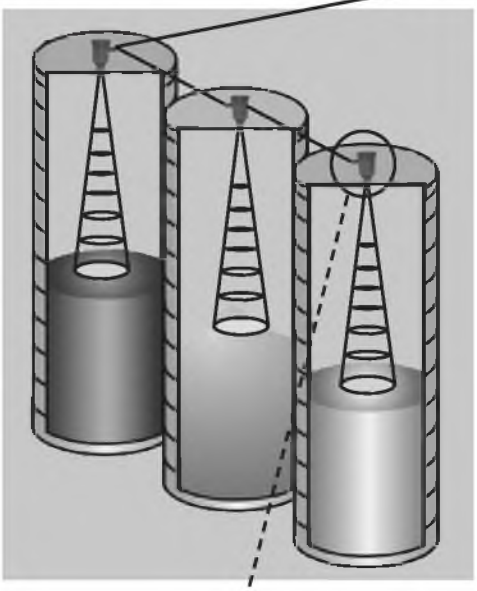
A Versatile, 51 Segment Bargraph with a 4-Digit LED Display with Relay and Analog Outputs Standard

* Modules with additional features available

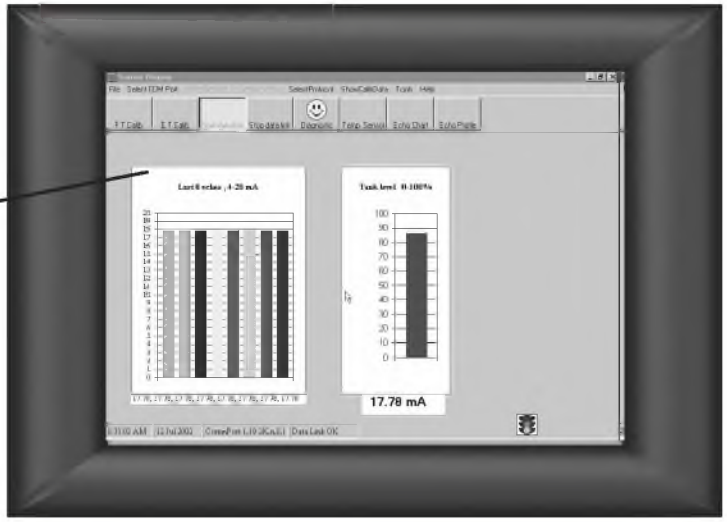
PC Based Software

BINMASTER

A single RS-485 data cable connects the PC running software with up to 128 SmartSonic and/or SmartWave transmitters



Main PC Screen



Provides Direct PC Based Inventory Management

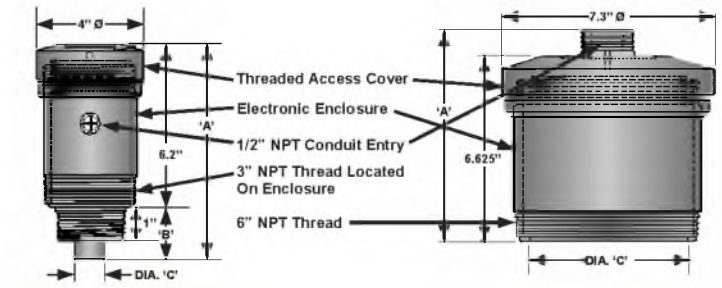
Built-in communication with a PC allows storage of the current output and temperature in a data logger. The data logger is linked with Microsoft Excel™. Up to 128 SmartSonic or SmartWave transmitters can be connected using RS-485 communication or a single transmitter can communicate directly with a PC using RS-232 communication. The PC software can provide a full diagnostic check including loss of echo, temperature sensor failure, noise error, and other conditions. A user can also see on the computer screen the echo profiles and echo stability chart. Through communications, some parameters can be changed, and also, a fixed point and programmable calibrations can be completed.

The SmartSonic Transmitter is available with a optional self-aligning carbon steel 3" ball and socket flange that provides a vertical connection for vessels with a radius dome or angled roof top and provides easy aiming flexibility.

SmartSonic & SmartWave Technical Specifications

1-800-278-4241

SmartSonic Ultrasonic Transmitter Technical Specifications

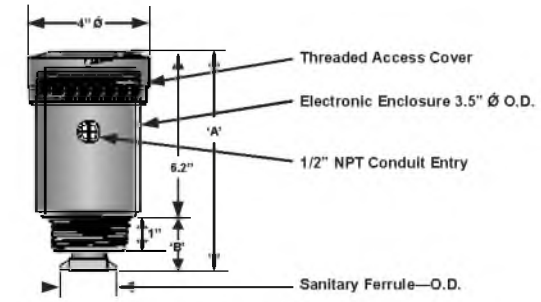


Models SS300/400-45U,52U,70U,80U,81U,and 148U

Model SS300/400-25U Only

MODEL	OPERATING RANGE	MOUNTING THREAD	DIMENSION 'A'	DIMENSION 'B'	DIMENSION 'C'
SS300/400-25U & UC	90 ft 27.4 m	6.0"/1.0" NPT	7.625"	N/A	5.75"
SS300/400-45U & UC	60 ft 18.2 m	3.0" NPT	8.9"	3.0"	3.0"
SS300/400-52U & UC	50 ft 15.2 m	3.0" or 2.0" NPT	9.3"	3.05"	2.2"
SS300/400-70U & UC	30 ft 9.1 m	3.0" or 2.0" NPT	8.5"	2.25"	1.8"
SS300/400-80U & UC	20 ft 6.1 m	3.0" or 2.0" NPT	8.5"	2.25"	1.8"
SS300/400-81U & UC	16 ft 4.9 m	3.0" or 1.5" NPT	8.4"	2.1"	1.5"
SS300/400-148U & UC	9 ft 2.7 m	3.0" or 1.0" NPT	8.25"	2.0"	1.1"

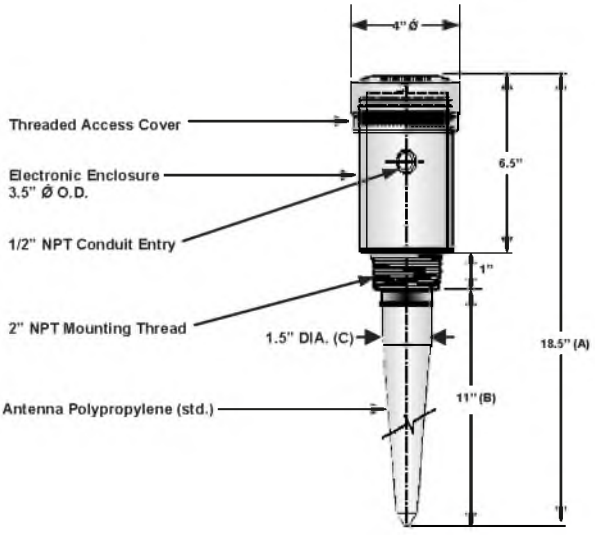
SmartSonic Sanitary Ultrasonic Transmitter Technical Specifications



Models SS300/400-70US,80US,81US,and 148US

MODEL	OPERATING RANGE	MOUNTING THREAD	DIMENSION 'A'	DIMENSION 'B'	SANITARY FERRULE 1.5"	SANITARY FERRULE 2"
SS300/400-70US & USC	30 ft 9.1 m	N/A	8.5"	2.25"	N/A	2.5"
SS300/400-80US & USC	20 ft 6.1 m	N/A	8.5"	2.25"	N/A	2.5"
SS300/400-81US & USC	16 ft 4.9 m	N/A	8.4"	2.1"	1.9	2.5"
SS300/400-148US & USC	9 ft 2.7 m	N/A	8.25"	2.0"	1.9"	2.5"

SmartWave Pulse Radar Transmitter Technical Specifications

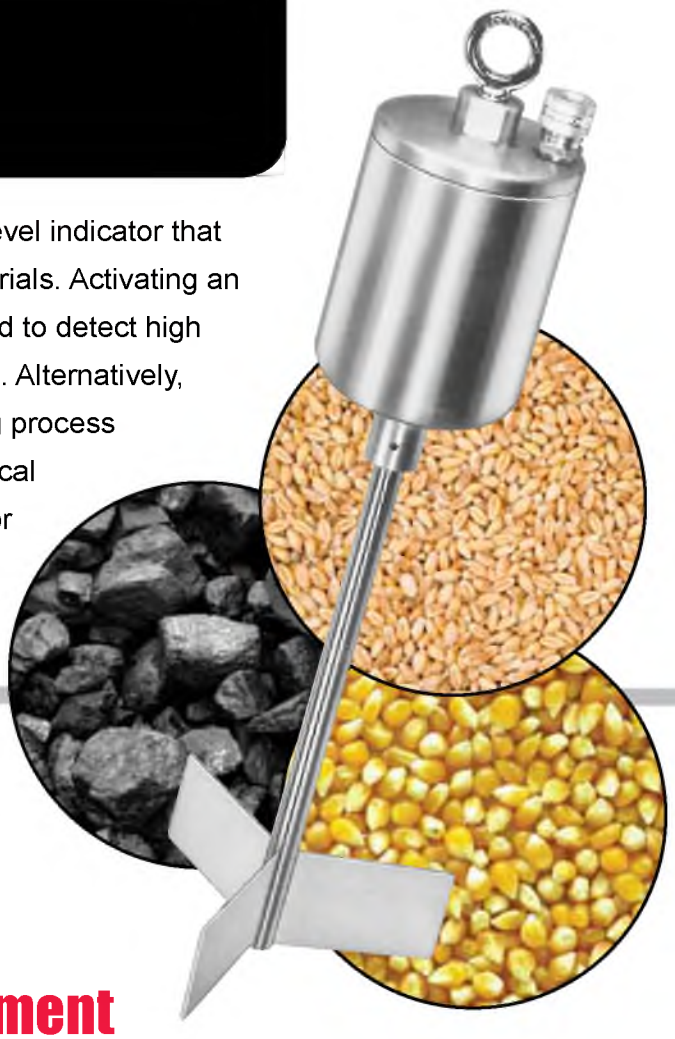


Models SS300/400-70US,80US,81US,and 148US

MODEL	OPERATING RANGE	MOUNTING THREAD	DIMENSION 'A'	DIMENSION 'B'	DIMENSION 'C'
SS300/400-050R & 050RC	50 ft 15 m	2.0" NPT	18.5"	11.0"	1.5" dia.
SS300/400–100R & 100RC	100 ft 30 m	2.0" NPT	18.5"	11.0"	1.5" dia.

Simple, Affordable Level Detection

The BinMaster tilt switch is a versatile, cost-effective level indicator that can be used in a wide variety of applications and materials. Activating an alert when the device tilts at least 15 degrees, it is used to detect high levels of large, heavy materials in bins, tanks and silos. Alternatively, it can be used to detect plugs or clogs in chutes during process operations. The tilt switch features a simple, mechanical design that allows it to also be used as a high limit sensor when positioned over open piles or conveyor belts.



Versatile Measurement for Tanks & Chutes

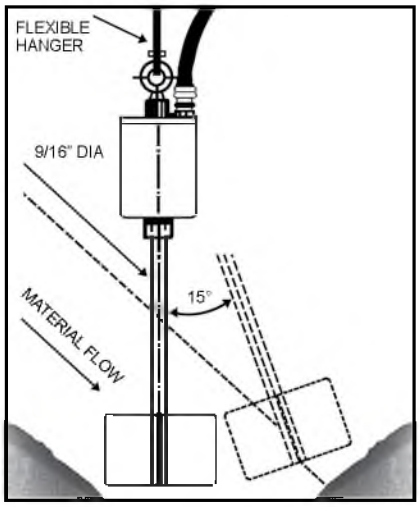
Its rugged design offers you reliable operation with only one moving part. When tilted at least 15 degrees, a steel ball inside of the device shifts position and activates a microswitch, alerting the user to a high level or clogged status. Generally, an optional stainless steel paddle extension or plastic sphere is installed on the end of the device to increase the sensitivity of the tilt switch. The tilt switch is installed over a desired control point using a wire rope, chain or other flexible hanger capable of supporting the device.

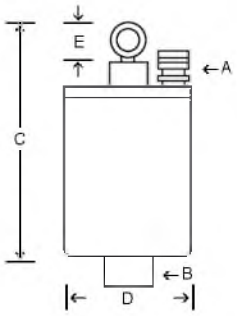
Tilt Switch Level Indicator

BINMASTER®

Tilt Switch Level Indicator

The tilt switch is suspended over a control point with wire rope, chain, or cable.* As material comes in contact with the paddle, the unit will begin to tilt. When tilted to 15°, a large steel ball inside the unit shifts position, actuating a microswitch.





INSTALLATION

Suspend the tilt switch over control point with wire rope, chain or flexible hanger capable of supporting the tilt twitch plus any paddle extension, if one is used. Do not hang the unit by its electrical cable.

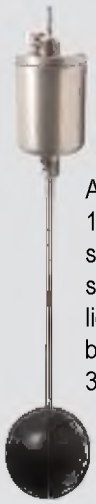
SPECIFICATIONS

Housing:	Cast aluminum
Weight:	3 3/4 lb. (1.7 kg)
Switch ratings:	15 A @ 125, or 250 VAC 1/8 HP @ 125 VAC, HP @ 250 VAC 1/2 A @ 125 VDC, 1/4 A @ 250 VDC

DIMENSIONS

Connector (A):	3/8" conduit, grommet for .312- to .437-in. diameter cable
Accessory Mount (B):	9/16" (14 mm) diameter 1/8" roll pin used for connection
Length (C):	9" (229 mm)
Diameter (D):	4" (102 mm)
Eye Bolt Hole (E):	7/8" (22 mm)

*Wire rope, chain, or cable not included.



A Tilt Switch with the 18" 316 stainless steel shaft and plastic sphere is used in light powder and bulk solids under 30 lb./cu. ft.

A Tilt Switch with an 18" stainless steel shaft and 316 stainless steel paddle is used in rock, aggregate and bulk solid material over 30 lb./cu. ft.

VIBRATING ROD

Vibrating Level Sensors

Simple. Rugged. Reliable.

- Unique single “Rod” probe design
- Insertion length from 7.37” to 19’
- Strong stainless steel construction
- Detects extremely light, fluffy materials
- LED status indicator light
- No calibration required
- Three sensitivity adjustments
- Wear and maintenance-free
- Auto sensing power supply
- Dual conduit entries
- Switch selectable high/low fail-safe
- High temperature units available
- Remote electronics available
- Suitable for high & low level indication, or plugged chute detection
- Optional hazardous location approvals

BINMASTER®

Vibrating Rod
Introduction

Single blade design eliminates bridging

Description

BinMaster's vibrating rod is a piezoelectric driven vibration type level switch that detects high, mid and low levels in bins, silos, and hoppers filled with powders or dry bulk solid materials.

High performance and reliability

- The single rod design with its sharp edged vibrating blade prevents bridging of material typically associated with the "tuning fork" design. The sword shaped blade also lets material easily flow by, and thus prevents material buildup.

- Material sticking on the vessel wall has no influence on the function of the vibrating rod. All vibrating rod sensors are tip sensitive, allowing them to overlook sidewall buildup.

- No false alarms due to rat-holing around the active sensor. The vibrating rod is driven with very low energy and will not dig a hole and cause false alarms.

- Fine tuning the vibrating system enables the instrument to reliably detect extremely light material with densities down to 1.25 lb./cu. ft.

Not affected by material characteristics

BinMaster's vibrating rod principle of operation overcomes difficulties associated with changes in dielectric constant, humidity, temperature, and material density. There are three sensitivity settings selected by a sensitivity switch on the sensor board:

Position A:	High sensitivity for light and fluffy materials
Position B:	Medium sensitivity
Position C:	Low sensitivity for materials that may form a deposit on the rod and heavier materials

Applications

- Salt
- Flour
- Spices
- Pellets
- Animal Foods
- Carbon Black
- Chemicals
- Foundry Sands
- Powdered Milk
- Beans
- Sugar
- Coffee Beans
- Peanuts
- Tobacco
- Grain
- Wood Shavings
- Chalk
- Paper Products
- Styrofoam
- Cellulose
- Glass
- Granulars
- Clays
- Polystyrene
- Gravel
- Sawdust
- Coal

How it works

BinMaster's vibrating level sensors are piezoelectric devices with a single blade shaped vibrating element. The blade of the sensor vibrates if there is no material covering the active element. When the blade is covered, the vibration is dampened by material and an electronic circuit forces a relay to switch indicating a covered condition. When the blade is uncovered, the vibration will restart and the relay will indicate an uncovered condition.

The blade design is carefully balanced to provide a very low loss "tip sensitive" vibrating system and requires a very small amount of energy to keep the system vibrating. In application, the vibrating blade is driven by a piezo crystal excited by the electronics system. The driving signal changes the physical shape of the piezo crystal which causes the mechanical vibration of the blade, much like a piezo type loudspeaker. The perfectly balanced mechanical system then resonates at the frequency of the drive signal. A second piezo crystal is used to detect the vibration of the blade, in turn signaling to the electronics if the blade is covered or not.

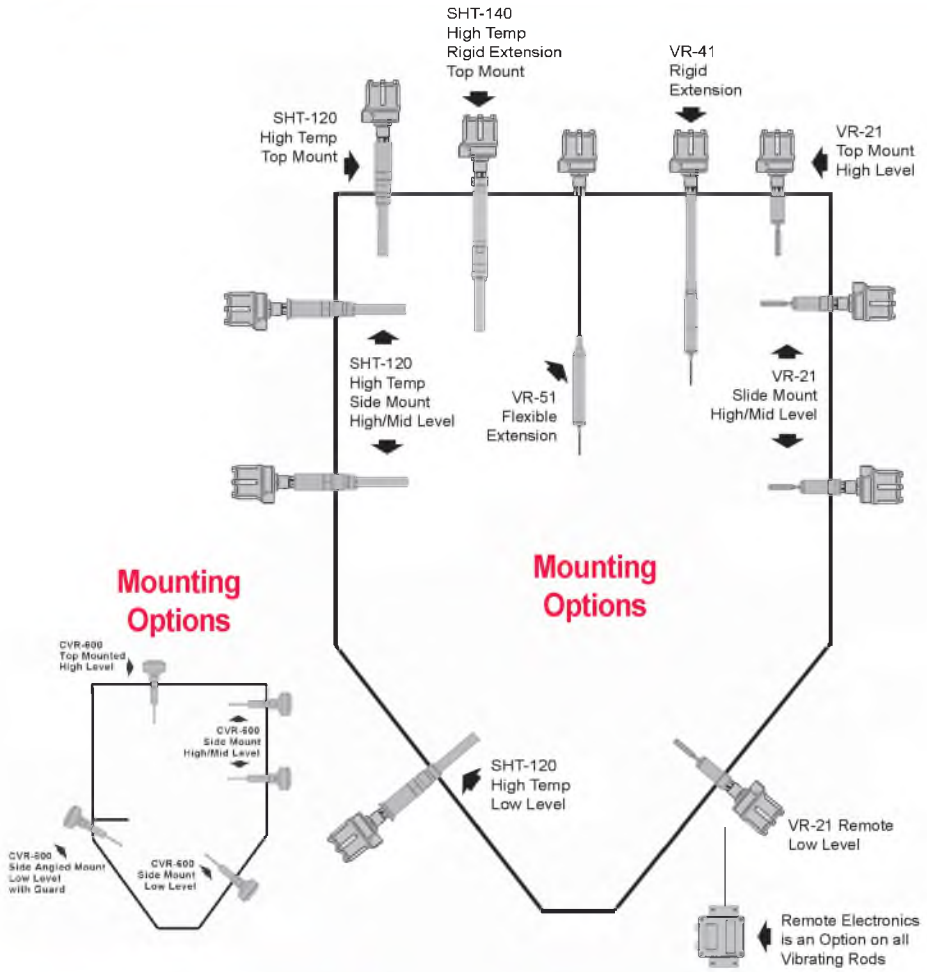
Detects extremely light and fluffy materials

Vibrating Rod Advantages

Mounting Flexibility, Various Configurations

VR-41 & VR-51 Extended Vibrating Rods

These two vibrating rods have been designed to allow extended insertion lengths of up to 19'. These configurations are intended for top mount applications. The VR-41 uses a rigid 1" pipe extension made with galvanized or stainless steel available in lengths up to 13'. The VR-51 uses a steel rope reinforced cable and allows insertion lengths of up to 19'. Both of these units are factory sized to customer specifications.



VR-21 Standard Vibrating Rod

The VR-21 is the standard model and has an insertion length of approximately 7". This model is suitable for both top and side mount applications. It mounts to the vessel with a 1-1/2" mounting socket. The VR-21 has optional CSA hazardous location approvals for Class II, Groups E, F and G.

CVR-600 & CVR-625 Mini Vibrating Rod

The compact vibrating rod is an economical, single rod, compact point level control for use in small bins and hoppers. The CVR-600 is for 1" NPT mounting, while the CVR-625 is for 1-1/4" NPT mounting. Overall insertion length is 6".

SHT-120 & 140 High Temperature Vibrating Rod

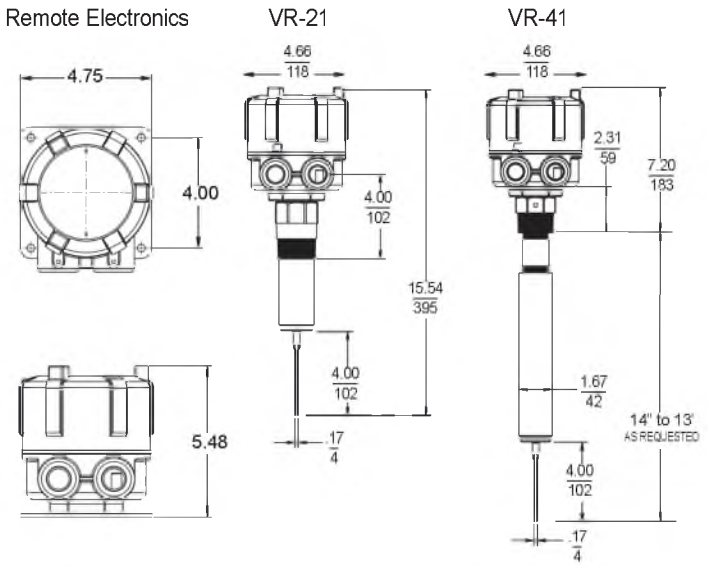
The SHT-Series has been built specifically for higher process temperatures up to 482°F (250°C). The SHT-120 has a standard insertion length of 7.24". The SHT-140 can be extended into a vessel from 13" to 13' with a rigid pipe extension.

VR Series Specifications

Input Voltage: Wide range 20 - 250V AC/DC
Power Consumption: 3VA
Relay: DPDT
Time Delay: 1 second from stop of vibration
2 to 5 seconds for start of vibration
Temperature Range:
- Ambient for electronic: -4°F to +140°F
- Process Temperature: -4°F to +176°F

Min. Material Density: From 1.25 lb./cu. ft.
Max. Granular Size: 1-1/2"
Max. Pressure: 145 psi
Conduit Entry: 3/4"
Mounting: 1-1/2" NPT
Enclosure: NEMA TYPE 4X, 5 and 12
Rod: AISI 304 Stainless Steel
Options: CSA hazardous location approvals
for Class II, Groups E, F & G
for VR-21 and VR-41 only

Dimensions

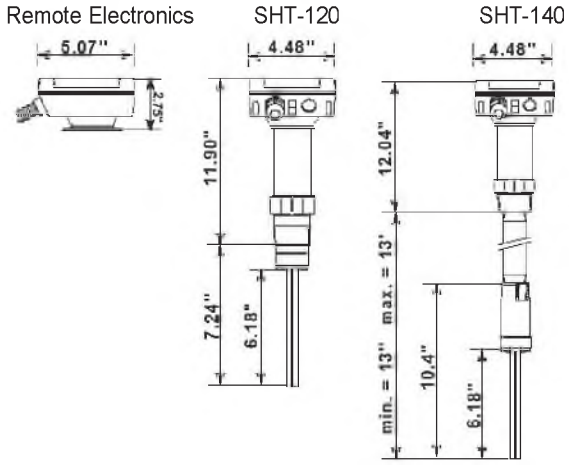


SHT Series Specifications

Input Voltage: Wide range 20 - 250V AC/DC
Power Consumption: 3VA
Relay: SPDT 5A 250 VAC (option: DPDT)
Time Delay: 1 second from stop of vibration
2 to 5 seconds for start of vibration
Temperature Range:
- Ambient for electronic: -4°F to +140°F
- Process Temperature: -4°F to +482°F

Min. Material Density: From 1.25 lb./cu. ft.
Max. Granular Size: 1-1/2"
Max. Pressure: 145 psi
Conduit Entry: 1/2"
Mounting: 1-1/2" NPT
Enclosure: Diecast aluminum NEMA 4
Rod: AISI 304 Stainless Steel

Dimensions

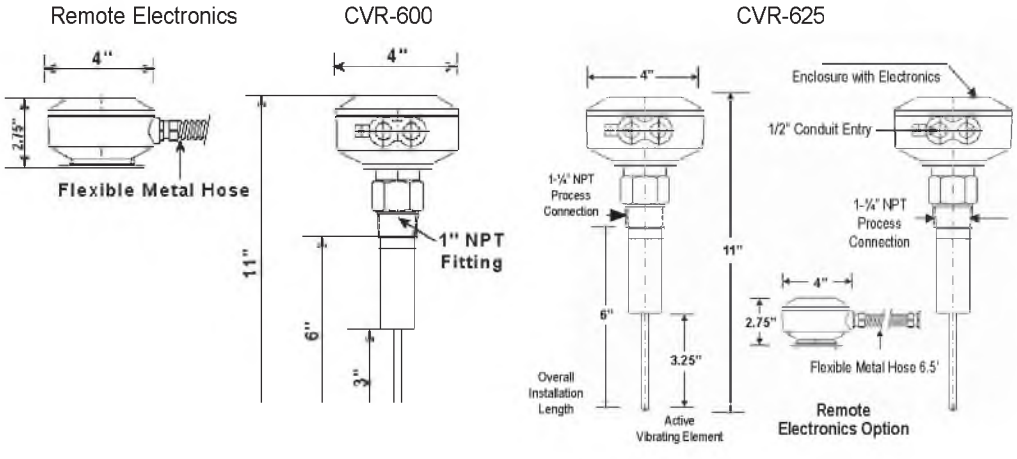


CVR Series Specification

Input Voltage: Wide range 20 - 250V AC/DC
Power Consumption: 3VA
Relay: SPDT 5A 250 VAC (option: DPDT)
Time Delay: 1 second from stop
of vibration
2 to 5 seconds for
start of vibration
Temperature Range:
- Ambient for electronic: -4°F to +140°F
- Process Temperature: -4°F to +300°F

Min. Material Density: From 3.5 lb./cu. ft.
Max. Granular Size: 1-1/2"
Max. Pressure: 145 psi
Conduit Entry: 1/2"
Mounting: 1" NPT or 1-1/4" NPT
Enclosure: Die cast aluminum NEMA 4
Rod: AISI 304 Stainless Steel

Dimensions



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